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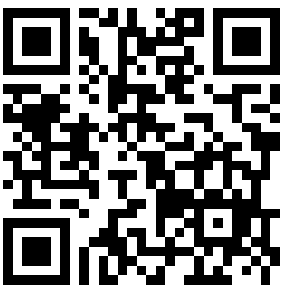
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Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

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Preparedness Always Pays!

¶ Are your plant and equipment in the best possible condition to give still greater production at lower cost, during the entire ensuing year?

¶ Are your products as highly refined as they could be to insure maximum production at minimum cost?

¶ Are your production and materials handling methods as efficient as they might be?

¶ These are pertinent questions, deserving of careful consideration by the executive who plans to get his share of the predicted prosperity of 1927.



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*CV Chrome Vanadium
WRENCHES



This is the Engineer's Wrench

Tremendous strength
Light Weight
"Pear shape" jaws for close corners
Nickel finish with polished jaws

*CV is a Bonney trademark registered in the U.S. Patent Office.
Chrome Vanadium registered August 11, 1925.

This is the No. 25 Set

6 Bonney *CV Chrome Vanadium Double End Engineer's Wrenches—different size openings at each end.

This set takes care of 21 different size nuts and bolts from 1/4" U. S. Standard to 3/4" Hex Cap Screws.

Complete as illustrated

$7.85

Attractive discounts to dealers. Special price to mechanics.

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Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

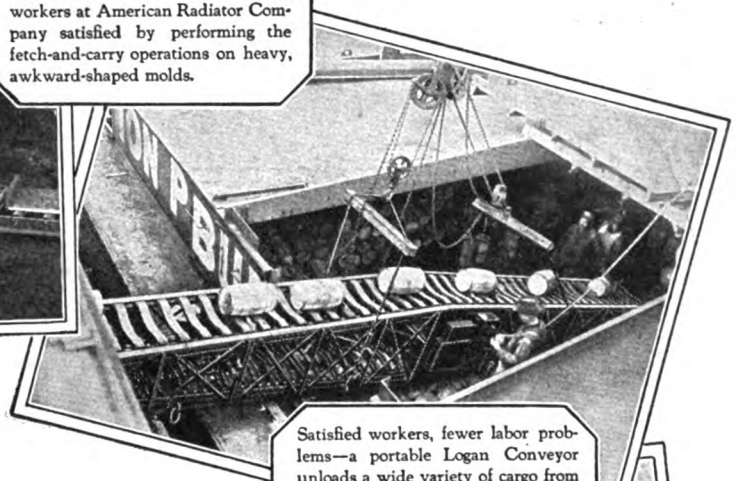
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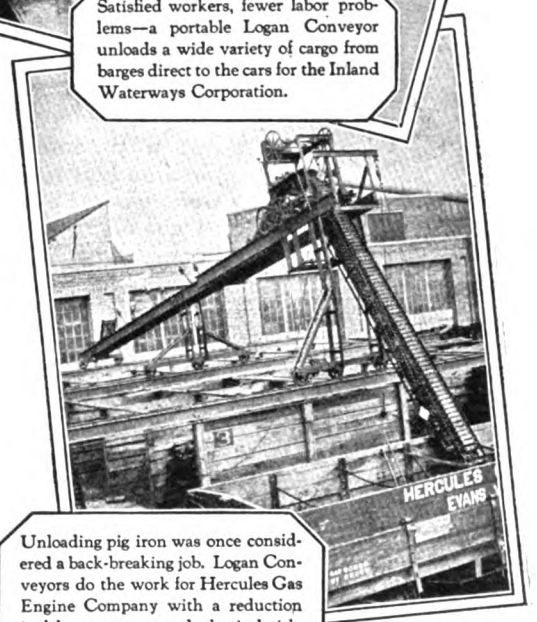
50 YEARS OF SERVICE ~ OUR GOLDEN ANNIVERSARY



Logan Conveyors help to keep workers at American Radiator Company satisfied by performing the fetch-and-carry operations on heavy, awkward-shaped molds.



Satisfied workers, fewer labor problems—a portable Logan Conveyor unloads a wide variety of cargo from barges direct to the cars for the Inland Waterways Corporation.



Unloading pig iron was once considered a back-breaking job. Logan Conveyors do the work for Hercules Gas Engine Company with a reduction in labor turnover and physical risk.

7 Keep the Men You Train

WHETHER it's "I quit" or "You're fired", every man you lose costs you real money in time, training, experience and lowered plant morale.

Logan Conveyors reduce labor turnover almost to the vanishing point by doing mechanically the irksome and often back-breaking tasks which have hitherto been basic causes of discontent among workers. Conveyorize your tedious, wearisome operations and you gain employe satisfaction in addition to immediate, tangible savings in wages, time, floor space, breakage and inventory. These are some of the reasons Logan Conveyors are today considered indispensable in many of the world's greatest industries. The coupon is for your convenience.

THIS is the SEVENTH and last of the current series of advertisements featuring the economies of Logan Conveyors. Send for the complete series—No. 1, *Savings in Labor*; No. 2, *Savings in Time*; No. 3, *Savings in Space*; No. 4, *Savings in Breakage*; No. 5, *Savings in Inventory*; No. 6, *Savings by Pace-Making*; No. 7, *Savings by Reducing Labor Turnover*. *The first of a new series of advertisements will appear next month.*

Logan Co.
INCORPORATED 1888
(Formerly THE DOW CO.)
LOUISVILLE, KY. *Offices in Principal Cities*

LOGAN CO.
Louisville, Ky.

Date.....

We are interested in conveyors. Send catalog ☐
Without obligation, have your representative call ☐
Send "Seven Economies of Logan Conveyors" ☐

Name.....

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Cut YOUR 1927 Production Costs
With
BURMALINE BELTING
Which Has Been Saving Other Companies Money Since 1914



Lower in Initial and Ultimate Cost

Burmaline is not a

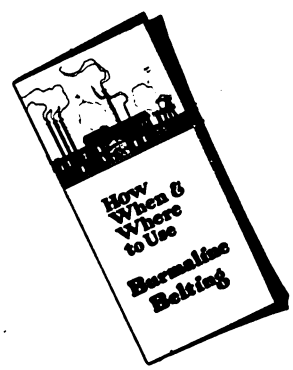
Solid Woven, Rubber, Leather, Balata or Stitched Canvas Belt

but a patented, composition belt for general transmission use. It has a cushion surface backed by a core which gives it great tensile strength and toughness.

Adaptable to over 95 per cent of all drives, motors, cross belts, shifters and open drives. BURMALINE BELTING WILL NOT PULL CROOKED. Withstands heat, oil, dust, and acid fumes. MADE IN ONLY ONE GRADE —Single, Light Double and Double, in continuous lengths with no laps or seams. Takes any type of belt lacing or can be made endless.

Excellent suction on the pulleys. Will not deteriorate with nor harden with age in use or in stock.

Summing it up, BURMALINE BELTING possesses all of the good but eliminates the weak points of Leather, High Grade Rubber, Balata, Stitched Canvas and Solid Woven Belting.



Under average conditions BURMALINE BELTING will deliver more power at less cost, with the same or longer life than any type of belting you can buy. MAKE US PROVE IT TO YOU.

Write for a new booklet, "How, When and Where to Use Burmaline Belting," containing much valuable data. It also fully describes its manufacture and uses and gives a list of big users, testimonials, etc.

BURRELL BELTING COMPANY

Manufacturers of Burmaline Belting—Alfalfa Belting—Ebony Transmission and Conveyor Belting—Universal Belt Oil and E-Z Grip Transmission Lining for Ford Cars and Trucks

416 South Hermitage Ave., CHICAGO, ILL.



The Publisher's Column

ANOTHER banner year, with still greater prosperity, awaits American industry in 1927, according to the consensus of predictions.

With ample capital available; with large orders on hand and the prospects of still more to come; with wages at a high peak, and with the best relations obtaining between management and labor, there is no apparent reason why 1927 should not be another banner year.

To make it so, however, requires that industry must keep pace with the times. It must be awake to the possibilities of new developments, new processes, and new ideas, all to the end that it may still further improve its plants, products and merchandising methods.

As a means to this end, the editorial and advertising pages of INDUSTRY ILLUSTRATED have for more than five years been a source of inspiration and information in improving industrial conditions, and will throughout the ensuing year, afford the same invaluable aid to those who keep step with progress.

Industry Illustrated

Published Monthly by

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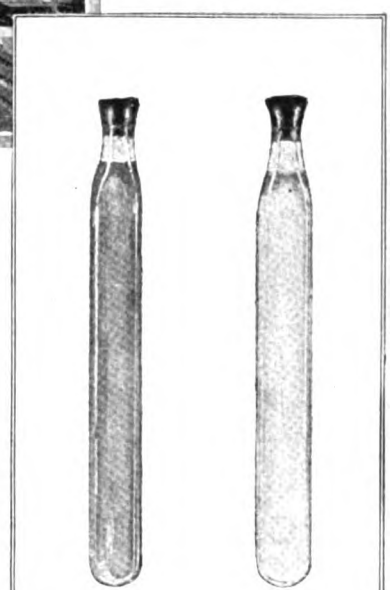
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LUSTROUS ✓ ✓ DURABLE ✓ ✓ WASHABLE ✓

WHITE PAINT



Thousands of industrial plants have found that Barreled Sunlight best combines the qualities they want in interior paint—and at the lowest cost per square foot of surface painted!



THE VIAL at left above contains refined linseed oil as commonly used in white oil paints. It is deep amber color. At right is the same oil after being treated by the "Rice Process." It is almost colorless. This is one of the secrets of the lasting whiteness of Barreled Sunlight. *These are actual photographs.*

GUARANTEED to remain white longer

THE CLAIM of lasting whiteness that we make for Barreled Sunlight is backed by this definite guarantee:

Barreled Sunlight will remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.

Practical proof of this quality over a period of years is one reason why Barreled Sunlight is the most widely used white paint for industrial interiors.

Another reason is *durable cleanliness.* The surface of Barreled Sunlight is so smooth it can't hold dirt embedded, and washes like tile. Repeated washing does not wear it away.

And because this lustrous paint reflects light of just the right quality, it greatly improves working conditions.

With all these advantages, Barreled Sunlight *costs less per square foot of surface covered.* Extremely opaque, it covers a larger area with a given quantity of paint; and containing no varnish, it flows so easily with brush or spray that there is a saving in labor hours.

Sold in 55- and 30-gallon churn-equipped steel drums, and in cans. Where more than one coat is required, use Barreled Sunlight Undercoat first. See coupon.

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5 Dudley Street, Providence, R. I.
New York—Chicago—San Francisco
Distributors in all principal cities

THE RICE PROCESS WHITE

Barreled Sunlight

Reg. U. S. Pat. Off.

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

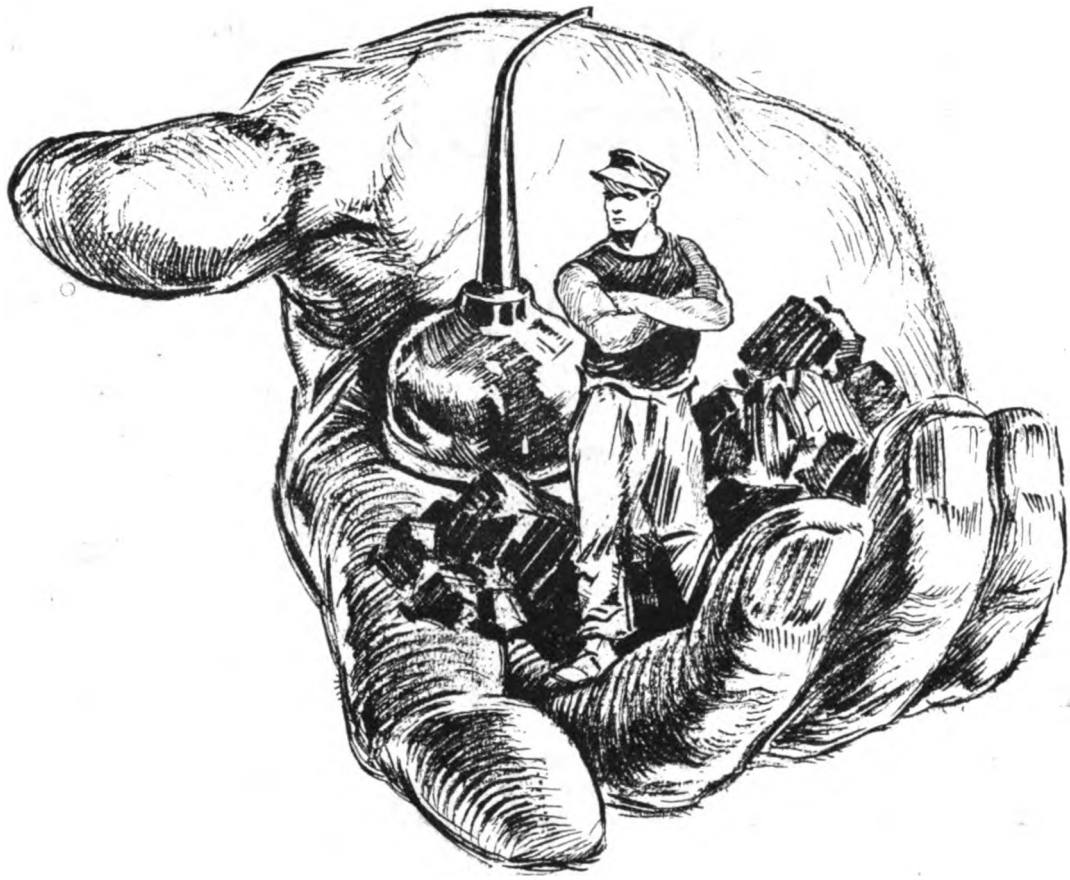
Please send us your booklet on Barreled Sunlight for industrial painting; also painted panel.

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friction says—"give—give—give!" the echo says—"waste—waste—waste!"

THE insidious thing about FRICTION in line shaft hangers is this: You can't SEE it at work. You can't HEAR it calling constantly for more power—more labor—more oil. If you could, you wouldn't tolerate it for a moment. But, if YOUR line shafting turns on plain bearings, you are paying more to KEEP them than it would cost you to REPLACE them with modern, Skayef Self-Aligning Ball Bearing Hangers, as thousands of plants have done.

SKF Anti-Friction Hanger Equipment SAVES in labor—in power—in lubrication.* One manufacturer reduced his power costs 25% in a single year, by changing to SKF equipment. Another reduced the matter of oiling from a daily problem to a twice-a-year detail. No wonder the average SKF hanger installation pays for itself in less than two years' time. No wonder, too, there are more than three million of these hangers in use today throughout the world.

*Combined Skayef Certified Surveys give full details of these savings in the plants of 17 manufacturers. Ask for your copy—today!

SKF

MARKED

Self-Aligning **HANGERS** *Ball-Bearing*

1717

SKF INDU[illegible]IES, INCORPORATED ~ 165 BROADWAY ~ NEW YORK CITY

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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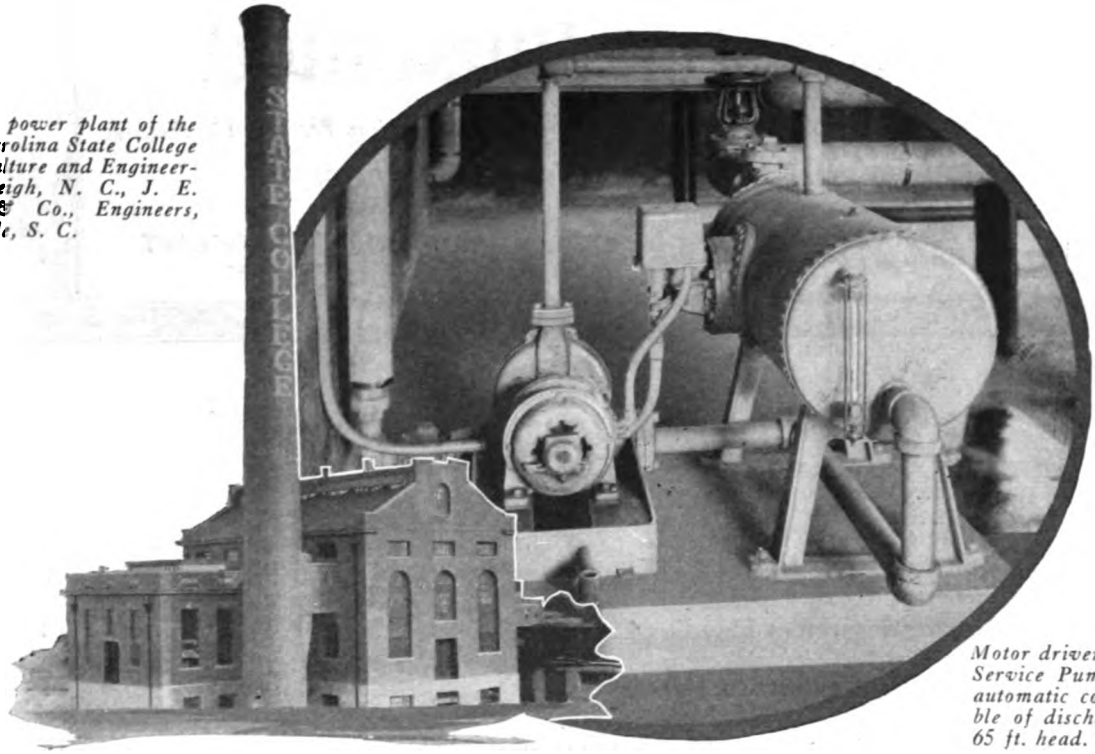
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A New Universal Grinder 98

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Helpful new literature for the man who selects and directs industrial equipment

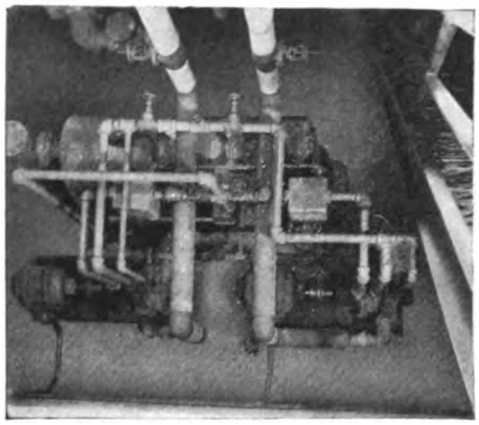
Readers' Guide to Profitable Equipment 102
Practical helps for mill and factory managers

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The new power plant of the North Carolina State College of Agriculture and Engineering, Raleigh, N. C., J. E. Sirrine & Co., Engineers, Greenville, S. C.

Motor driven Jennings House Service Pump, arranged for automatic control, and capable of discharging against a 65 ft. head.



Looking down on the two motor-driven Jennings Vacuum Pumps, for removing the condensation and air from the return line of the heating system, State College, Raleigh, N. C. The pumps are arranged for continuous operation—each unit is capable of handling 65,000 sq. ft. of equivalent direct radiation.

To work with modern power-plant equipment

When the North Carolina State College of Agriculture and Engineering decided to build a new power plant, it planned to make this a part of the mechanical engineering laboratory.

Machinery was chosen with a view not only of providing economical power, but also of permitting the students to work and become acquainted with modern power-plant equipment.

Jennings Pumps were chosen,—for the heating system and the house service lines. A significant tribute to the recognized excellence which characterizes Jennings equipment.

NASH ENGINEERING COMPANY

SO. NORWALK CONNECTICUT

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Jennings Pumps

RETURN L' E VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

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The Aristocracy of Accomplishment

Abstracts from the philosophy of Charles M. Schwab, as outlined to the members of the American Society of Mechanical Engineers on the occasion of his recent election to the presidency of that Society.

I HAVE preached democracy all my life. I am one of the men that believe that the aristocrat of today is not the man of birth or wealth or social position, but the man who does something worth while for his fellowman. So I keep preaching this regardless of who the man is, what his station in life, if he is a good man and an honest man and does his duty, he is the real aristocrat of his time.

Years ago when I was associated with Frick in the Carnegie plant, I sent for the superintendents and established the rule of a luncheon every Saturday, at which not one word of business was to be spoken until after the luncheon. The stories and the fun were uproarious at times. Good Mr. Frick, who was of a serious turn of mind, wrote Mr. Carnegie and said that he thought the traditions of the old Carnegie firm were being abused by this levity in the board room. Mr. Carnegie was in Florence and he sent me back the picture of a huge monk who had nothing but the robe on his back, and said, "Hang this in your boardroom and every time you are inclined to be serious look at this old fellow and see how happy he is with nothing but his robe and girdle, and remember always good business is never done unless you are in a happy frame of mind."

The engineering profession (especially the mechanical engineering profession) is one that has lent itself so much to development of industry of this country. Your speaker has seen nearly fifty years of industry in this great United States of ours and nothing that I can say to you so well illustrates the importance of the work which you have done than when I say that with but six per cent. of the population of the world, we do more than fifty per cent. of all its manufacturing. Why? It has been because of the skill and development of the engineer, especially the mechanical engineer.

I practised roughneck engineering for twelve years. I built steel works at Homestead and other parts of Pittsburgh, and felt a great deal of credit in doing



© *American Society of Mechanical Engineers*

Charles M. Schwab, newly-elected president of the American Society of Mechanical Engineers, was born in Williamsburg, Pa., February 18, 1862. In his boyhood, he drove a stage coach between Loretto and Cresson Station. At 18, he took a clerkship in a country grocery store at two dollars and fifty cents a week. A few months later, he surprised Mr. Jones, of the Edgar Thomson Steel Works, by asking for a place with that organization. And so, at six dollars a week, driving stakes, he began that career in the steel industry, whose later chapters are so well known.

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it, but it didn't require so much an engineer as it did a man of common sense without great refinement of mechanical details to build the great blast furnaces and rolling mills, and yet, make them commercially practicable.

I was associated with an old gentleman, a Welshman, uneducated, knew nothing of mathematics or chemistry, and yet, a man of whom Henry Bessemer said (and I am one of the few living men who knew the great Henry Bessemer in the years gone by), "This man has contributed more to the mechanical development of iron and steel than any man who has ever lived." That was old Captain Bill Jones of the Braddock Works. Some of you may remember him. He was a great man. His reports were not highly scientific but they were always to the point. I remember one of them with relation to the Bethlehem Works. He and good old Mr. Frick were good friends. The Carnegie people considered buying the Bethlehem plant; Captain Bill, however, was concerned chiefly with pig iron and rails and structural steel, and things of that sort. So Mr. Carnegie sent Captain Bill out to visit Homestead and report what kind of works it was. The report was not very voluminous, indeed, it contained but one sentence and that sentence was, "It is the biggest gun with the littlest squirt I have ever seen."

Captain Bill Jones, the "Father of Steel"

Captain Bill was the man who knew so little of chemistry and yet did so much in his rough way that when great engineers commenced to specify the amount of phosphorus and carbon should be in the steel, turned to me and said, "Charley, this damned chemistry is going to spoil the steel business yet." That was the point of view. Yet, he was an innate genius, the one and only man I ever knew who wasn't afraid to say to Mr. Carnegie anything he liked. Carnegie was fond of him. Coming out to the works, one time when Carnegie was about to leave for Europe, to say good-bye to Captain Bill, he turned to him and said, "Captain Bill, I am sorry to leave you here in the heat and sweat and grime of the mill while I go abroad to enjoy myself. I can't stand the hot climate and I must get away. When I get on board that ship and get out of sight of land, you have no idea how happy I am, how relieved."

"No, Andy," said Captain Bill, "and you have no idea how relieved I am, too."

My early days of engineering were spent with this great man and I learned to love him as I loved no other man. He was a genius and the work that he accomplished has lived so that I am able to say there is no steelworks in the world today of any importance that could possibly run for a single twenty-four hours without inventions and developments that Captain Bill made thirty-five years ago.

There is nothing in my long lifetime of work that has given me such supreme pleasure and satisfaction as the good-natured, hearty appreciation, coöperation and good fellowship of those with whom I have labored. Money hasn't been the only thing in life. There comes a time when money brings but little satisfaction. But there never comes a time when the appreciation of good fellowship and friends is not heightened and increased by the years that one has to live. It is that which lasts for all time and if a man can bring into the lives of some men a fuller appreciation of that great possibility, then he has done some real good in life. I have failed to find the man yet in my lifetime, however great and distinguished he may have been, that is not susceptible to the approval of his fellowman. I never criticize in my industries because a man that can only be driven to do things is not the man who will attain great heights, but the man who has the ambition to have the approval and good fellowship and friendship of those with whom he is associated has within his soul the necessary elements that will make him a great leader of men and a great leader of industry.

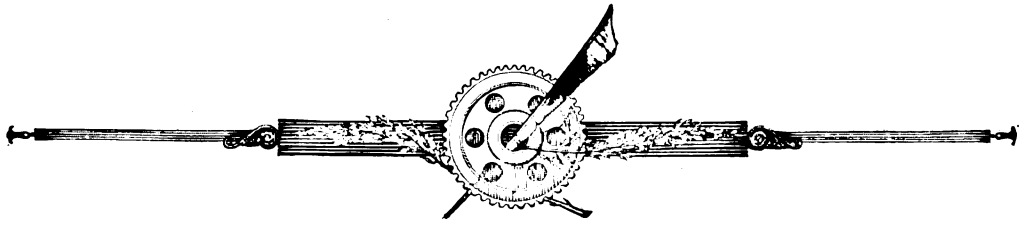
I like my old clothes, my old hat, old slippers. I like my old friends, I like my old associates. Boys, I like humanity. I love humanity. This is a better world than many people try to make us believe it is. I have seen nothing but kindness and brightness and sunshine through my life. You can look for sad and harrowing things, dishonest people and ungrateful people if you want to, but I try to forget them and look on the bright and happy things in life. Whatever befalls me, I will have the consciousness of knowing I have had fifty years of happy association in industry, successfully, nationally, and every other way. The Lord has been good to me in a great many ways, with good health, good friends, happiness and good disposition.

When manager of the Homestead Works, filled with pride and big-headedness with my job and referring to the job as "manager of this company," I was anxious that work should reflect creditable management when the president of this company came to visit. Therefore, things were swept up and in good shape when he was expected. Coming to one of the great open hearth casting pits and looking down, I saw an Irish laborer sitting on a wheelbarrow, smoking a pipe, and having a good loaf. That will be recognized immediately as a bad example. I said, "Hey, what are you doing down there?"

He said, "Who are you?"

I said, "I'm the manager here."

He said, "Young man, you have a damned good job; take care of it."



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Diversified Uses of Centerless Grinding

By Frederick B. Heitkamp

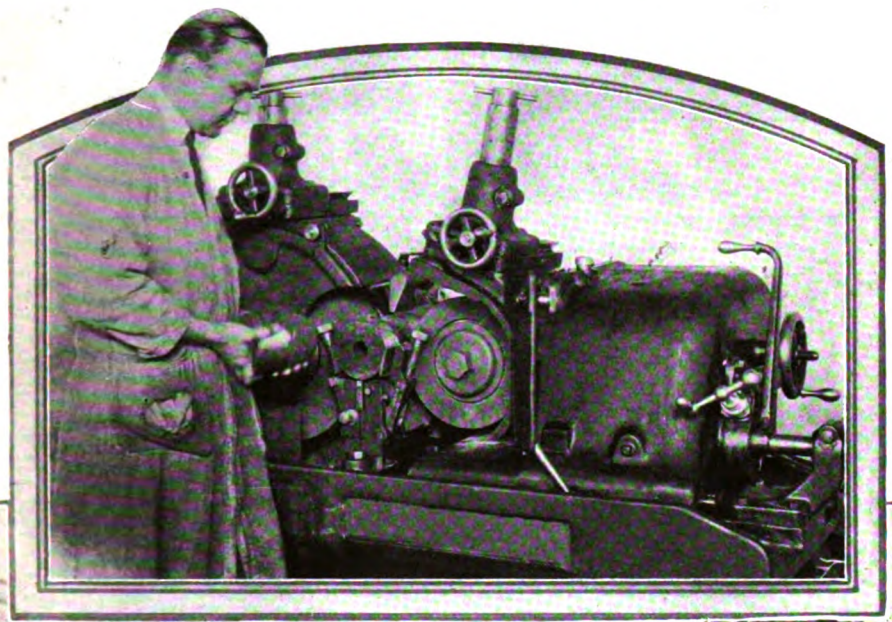


Fig. 1. An unusual job for the centerless grinder. Grinding pipe balls of large diameter.

Fig. 2. Grinding hardened steel ring seats at the rate of 200 an hour is a simple task on this grinder. (Below.)

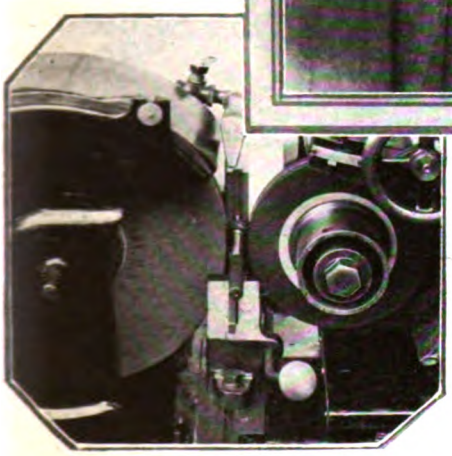
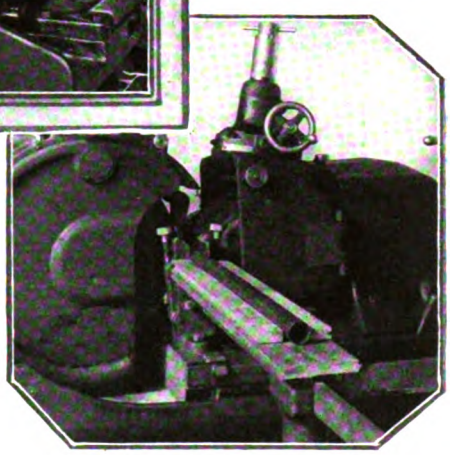


Fig. 3. Rubber tubing is also ground to accurate external diameters as is shown in the illustration below.



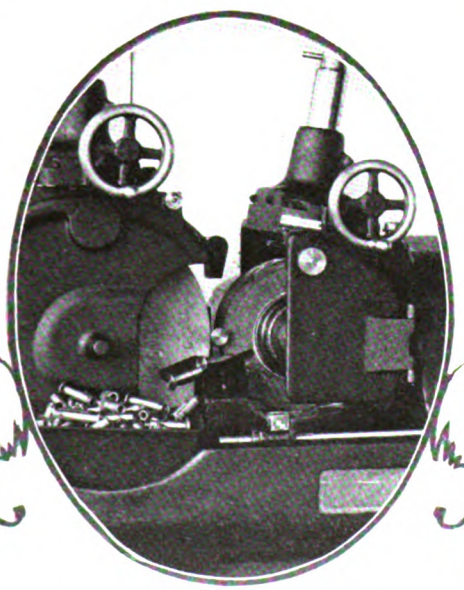
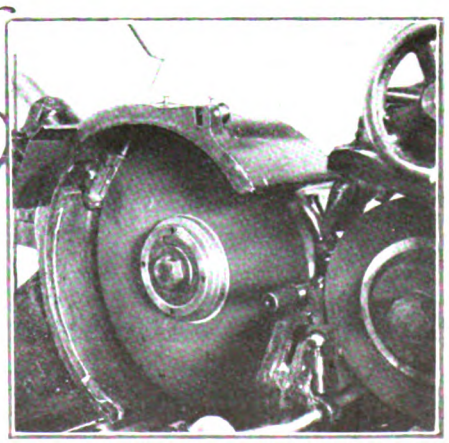


Fig. 4. An automatic shoulder grinding ejecting device as used in a centerless grinder for grinding valve tappets.

Fig. 5. Pointed carbon sticks are being ground in the centerless grinder shown below.



Fig. 6. Grinding spherical shaped ball studs at the rate of 360 an hour.



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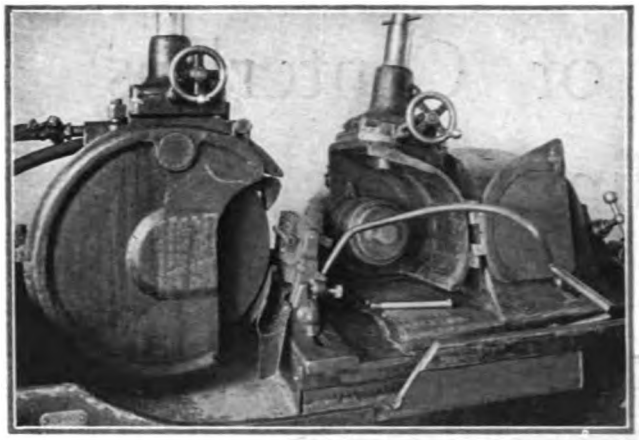


Fig. 7. The operation above is that of grinding shackle bolts at the rate of 10 to 15 pieces a minute.

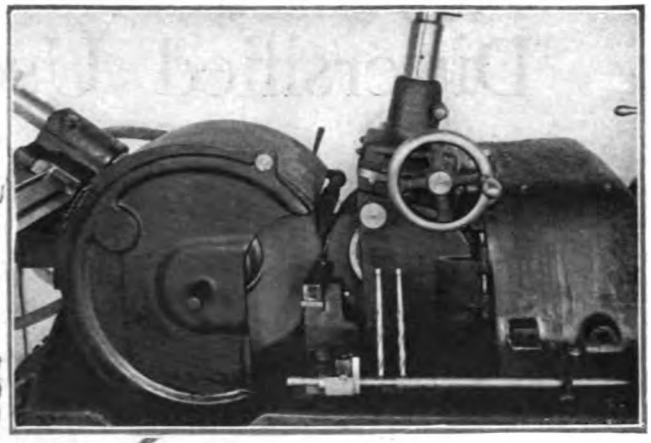


Fig. 8. The illustration above shows how 200 twist drills an hour are finished in a centerless grinder.

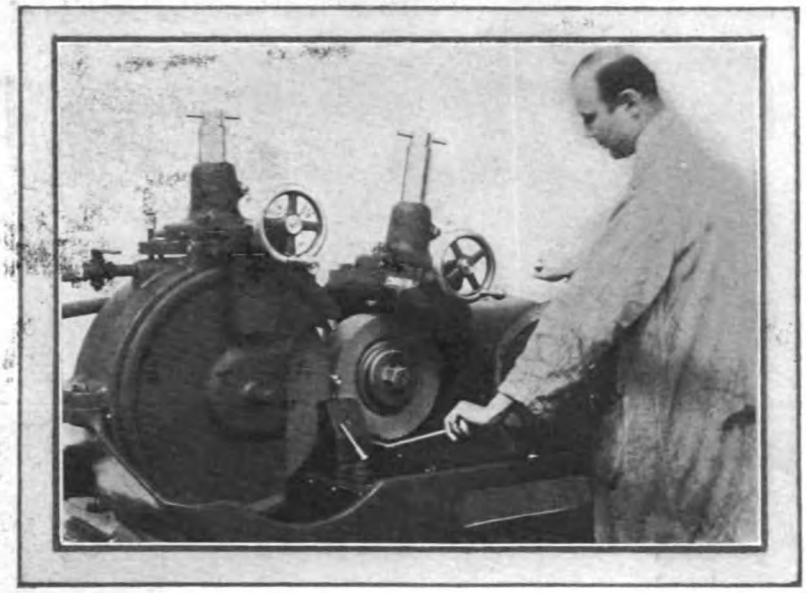


Fig. 9. The method of grinding two diameter work is shown above. The grinding wheels are trued to two diameters thus producing the desired form of the work.

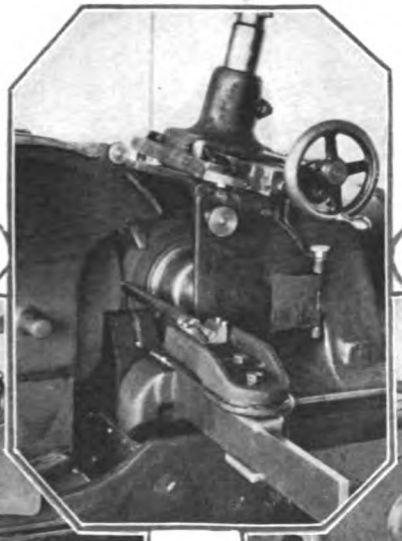


Fig. 10. Grinding one end of a shaft concentric with the other is an easy task on centerless grinders using the support for the shaft.

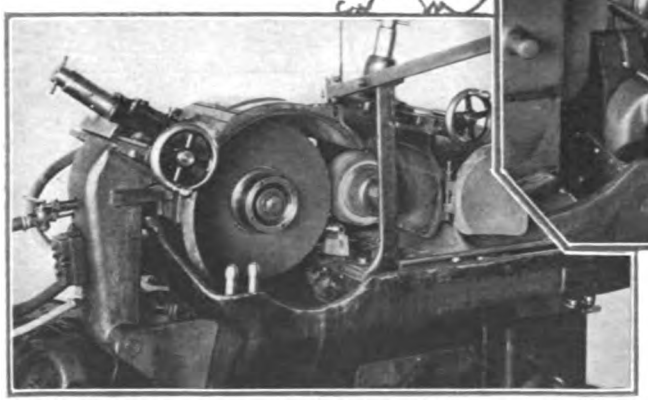


Fig. 11. An illustration of form grinding on centerless grinding machines.

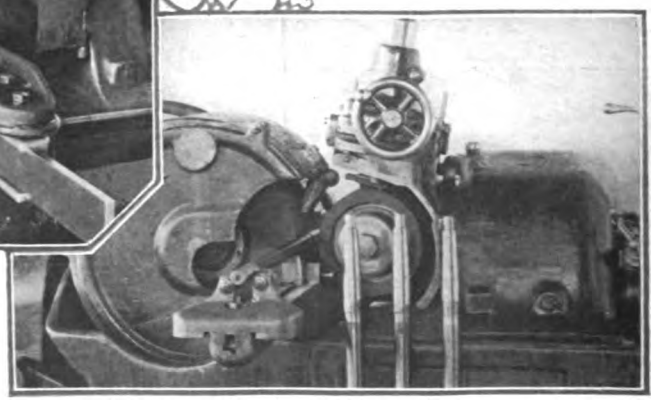


Fig. 12. Centerless grinding rear axle shafts at the rate of 50 an hour.

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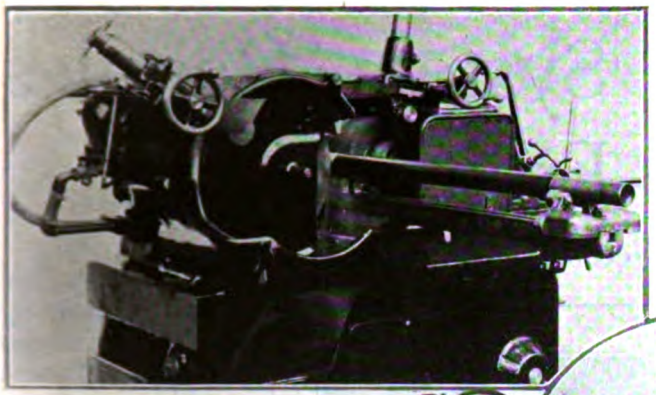


Fig. 13. Centerless grinding automobile torque tubes at the rate of 30 an hour.

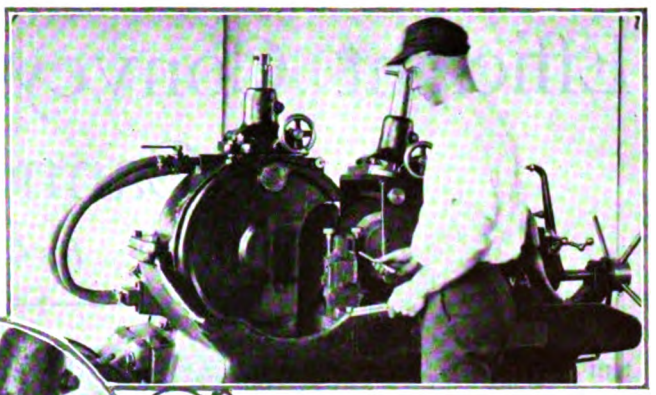


Fig. 14. Short bars are ground by what is known as the "straight through" method.

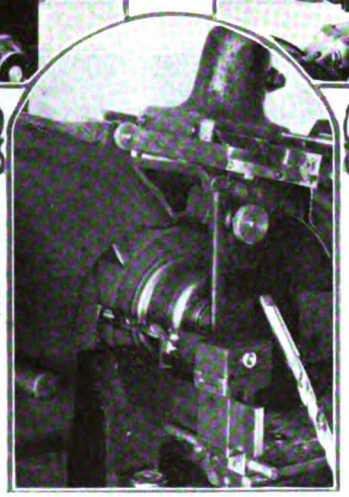
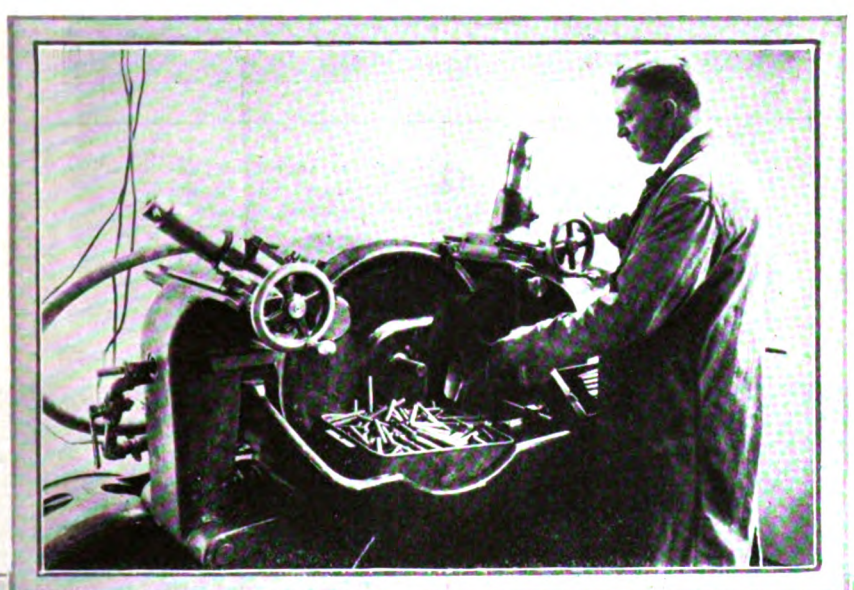


Fig. 15. Taper shanks on drills are ground in centerless grinders at the rate of 200 pieces an hour. Special truing fixtures are used to give the wheels the correct taper. (Right.)

Fig. 16. Steel is not the only product finished in centerless grinders. In the illustration below the operator is finishing rubber barrels for fountain pens, turning out 800 an hour.



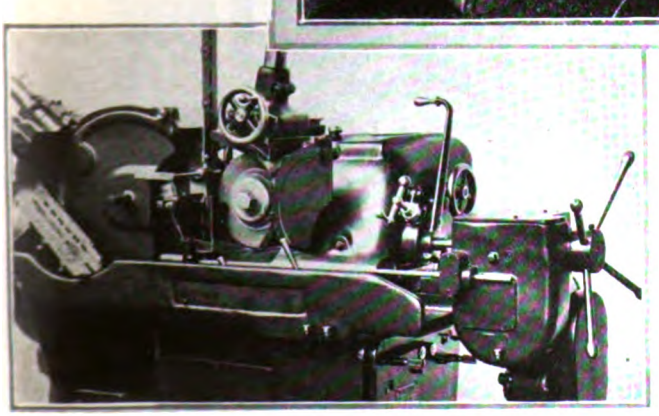


Fig. 17. An ingenious arrangement for grinding the entire balance staff of one of the well-known makes of alarm clocks.

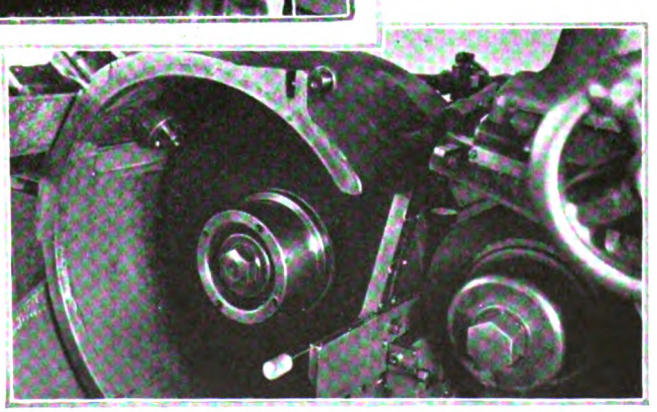


Fig. 18. Hardened steel clock balance staffs and also finished in centerless grinders at the rate of 15 to 20 a minute.

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Efficient Conveyor System Handles Canned Fruit

By C. W. Geiger

A VERY efficient conveyor system is in use at the cannery of the George Hyde Co., Campbell, Cal., which delivers trays of canned fruit from the cooling department to the storage department in the basement of the plant. As shown in Fig. 1, a belt conveyor delivers the trays of canned fruit to a gravity conveyor which carries the trays along the wall of the warehouse, as shown in Fig. 2. If the cans are to be stored on this floor they are removed from the gravity conveyor and piled up on the floor. If the trays of fruit are to be delivered to the basement warehouse, they continue down the gravity conveyor shown in Fig. 2, and by means of a spiral conveyor are lowered to the basement floor, where they are carried along the wall of the basement by the gravity conveyor shown in the foreground in Fig. 3. Here the trays of cans are removed and the cans piled. The empty trays are then delivered back to the cooling department by placing them on the belt conveyor shown, passing through the opening at the far end of the room. This conveyor delivers the trays to a gravity conveyor which in turn delivers them back to the cooling department.

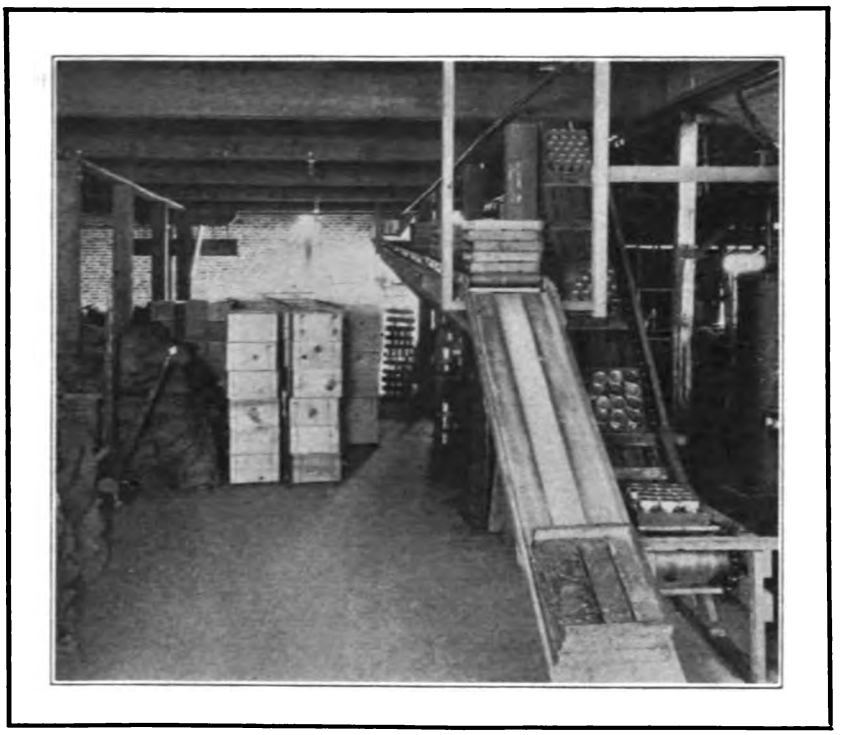


Fig. 1. Empty trays returning to the cooling department and loaded trays on their way to the storage rooms, in a modern canning factory.

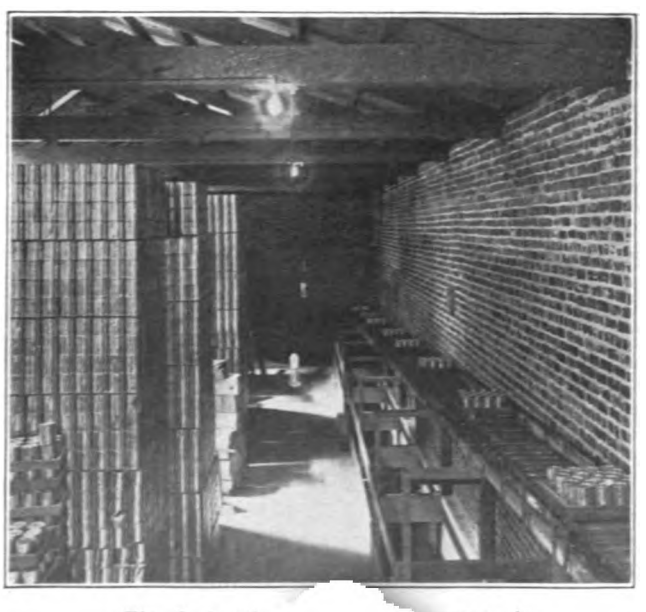


Fig. 2. Anoth... conveyor in-
stallation in ...g factory
showing ... cans.



Fig. 3. Still another view in a modern canning factory showing two types of conveyors in use for handling cans.

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Building Machinery Without Castings

By Robert E. Kinkead

WELDED steel construction in place of gray iron castings represents a comparatively recent development in machinery building which promises to produce sweeping changes in the manufacture of machinery. This new engineering practice is undoubtedly a part of the general trend towards greater refinement of machine design. The great ingenuity of the American machinery builder in the matter of producing machinery to supplant manual operations, is a recognized and established fact. It seems reasonable to expect that the tendency in the next decade will be towards the production of machines which will do the expected job efficiently, but, due to greater refinement in the matter of design and choice of materials, the machine itself will cost very much less than it would cost today. The use of standard steel shapes, plate, tubes, etc., welded together to make machinery parts, is an economic development of considerable importance in this direction.

The accompanying illustrations showing automatic carbon arc welding machinery built by the Lincoln Electric Company of Cleveland show the wide range of machines to which this engineering practice is adaptable. With the exception of a few small complicated castings this whole line of machinery is built of standard steel shapes, plates and tubes.

Weight reduction amounting to more than 60 per cent. was effected in this line of machinery, due to the use of welded steel construction in place of gray iron castings. This economy in material was possible because of the superior strength and stiffness of steel as compared with cast iron.

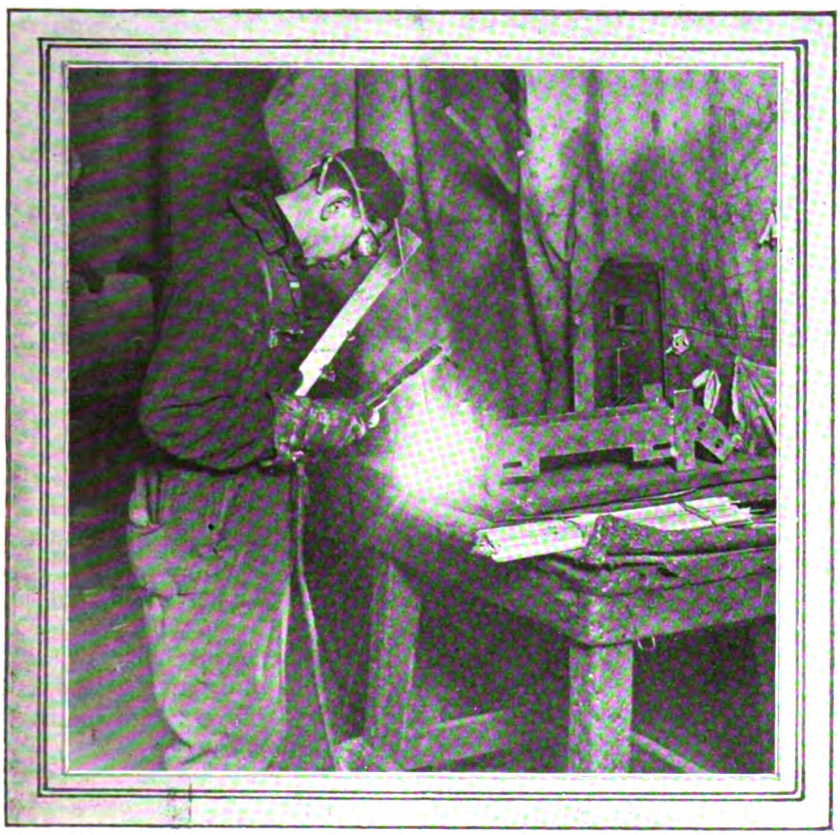


Fig. 1. A typical example of the application of the art of arc welding to industry: an operator engaged in welding small metal parts, using a fixture to hold the work while welding.

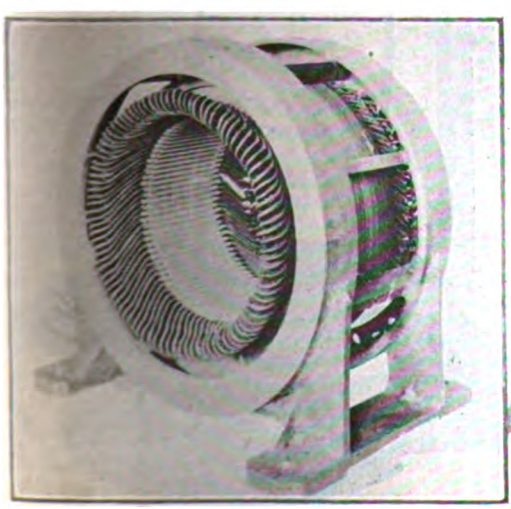
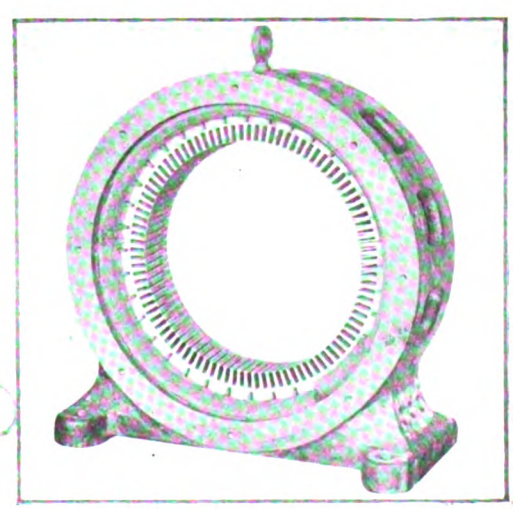


Fig. 2. Two examples of electric motor construction. At the right is the conventional type with a cast iron frame and at the left is the newer method of building up the frame of steel parts. Notice the opportunity afforded for better ventilation and reduction in weight.



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Weight of material is never added in steel construction to guard against possible breakage in handling or shipping, while in using gray iron castings this is a factor which cannot be safely overlooked. For all practical purposes, steel in a machinery part is unbreakable. The worst that can happen is that the steel part may be bent, in which case it can readily be straightened.

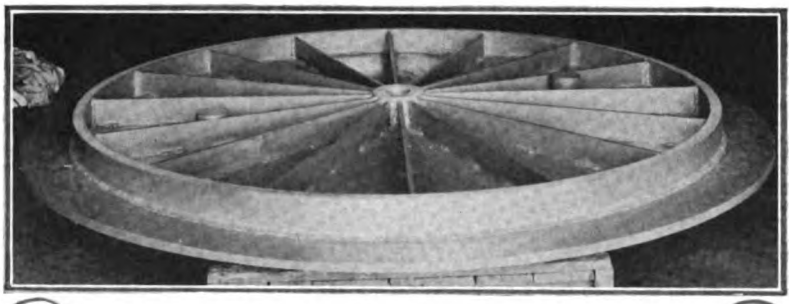


Fig. 3. A circular platform made entirely of fabricated steel parts welded in place.

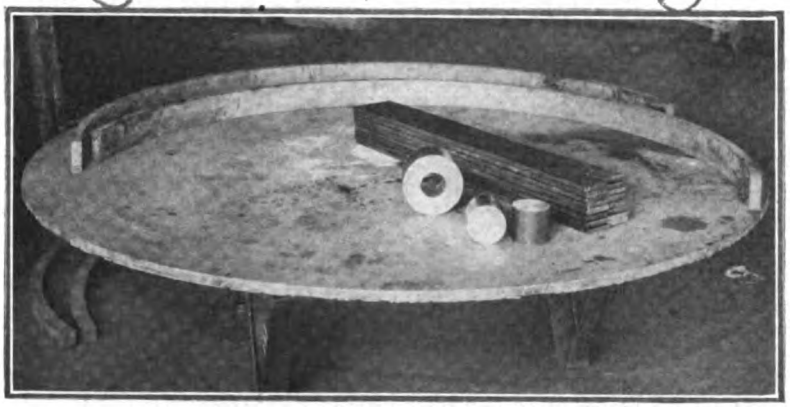


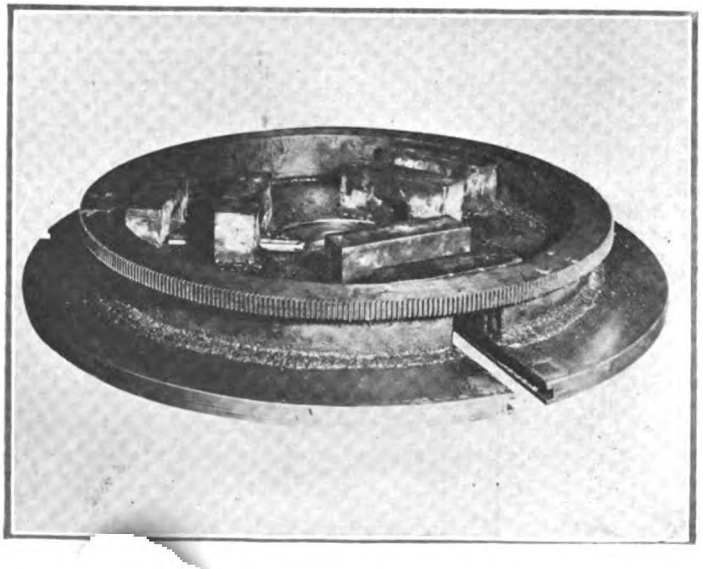
Fig. 4. Material ready for assembling into the steel plate or machine table shown above.

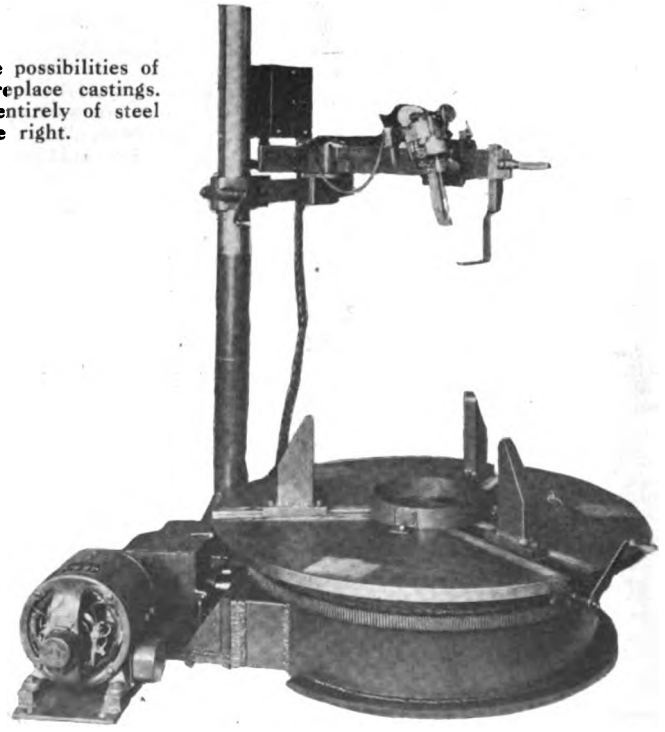
The cost of rough castings averages around $120 a ton. The welded steel construction equivalent to the rough casting costs slightly under $60 a ton. In no case is more than half the weight in steel required to reproduce the equivalent of the casting. Thus a 2,000 pound casting costing $120 is reproduced in the welded steel construction at a cost rarely exceeding $30. This shows a material saving of 75 per cent. Welding fabrication of the standard steel stock into the required shape (not including cutting) costs on the average about a half a cent a pound. On some of the machines the material saving in dollars was more than 85 per cent., due to the fact that the strength of the material in tension, was a determining factor so that the superior strength of steel in tension permitted a weight reduction considerably in excess of fifty per cent.

Elimination of patterns is an important item in the list of cost reductions effected by the welded steel construction. Parts are made in the welding department direct from drawings. A few simple fixtures are used for assemblies but these fixtures are made in the welding department and are a negligible item of expense. For the line of machinery illustrated, a saving in initial capital outlay for patterns of $165,000 was made by using welded steel construction. The initial outlay for patterns does not cover all of the items of pattern expense since continual improvement in the design of machinery calls for pattern changes and pattern scrapping which becomes an important element in the expense of building a line of machinery.

Reduction of inventory by use of the welded steel construction contributes to the desirability of the practice. The standard steel shapes used are always available

Fig. 5. Another example of the possibilities of welded steel construction to replace castings. This special chuck was made entirely of steel for the machine at the right.





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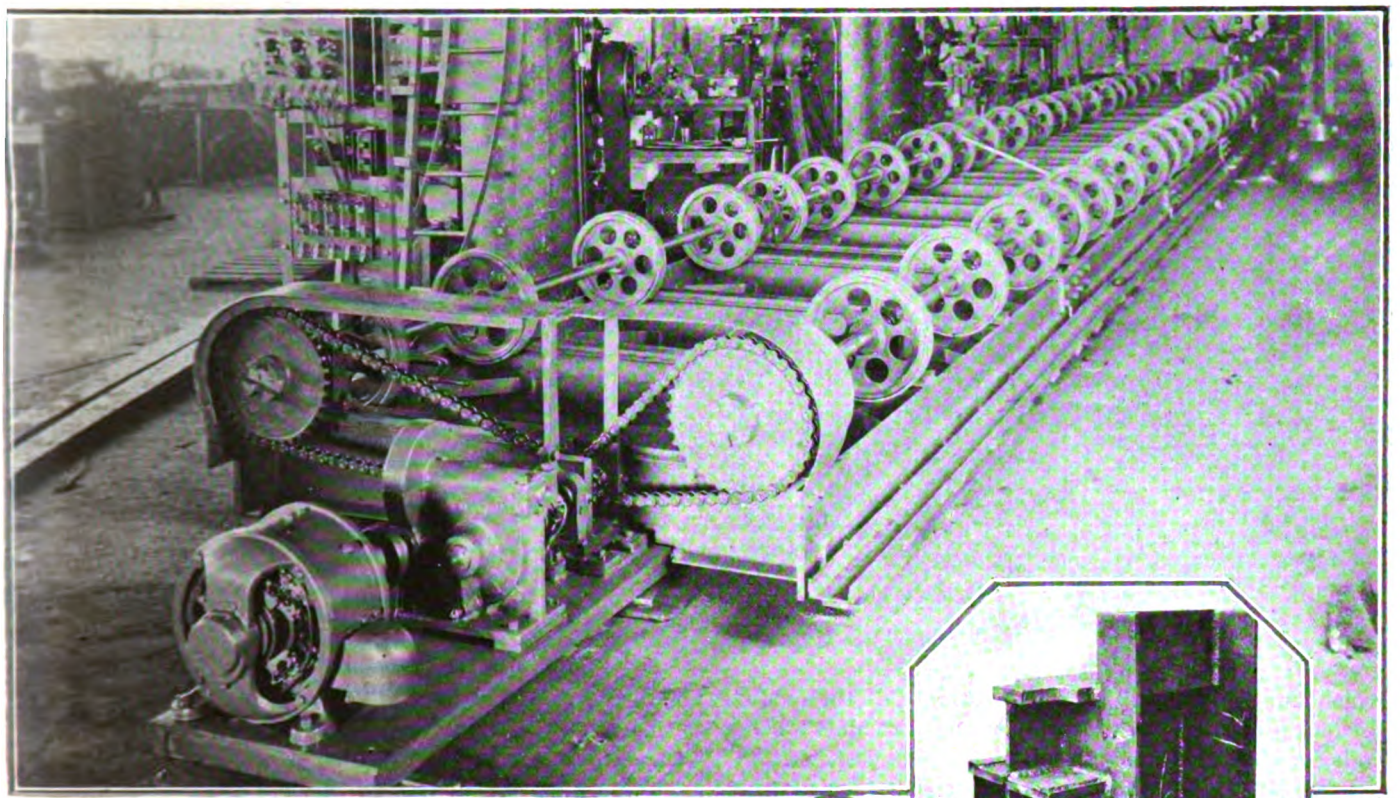


Fig. 6. In machinery requiring long bed plates, such as that shown above, welded steel construction can be used to advantage.

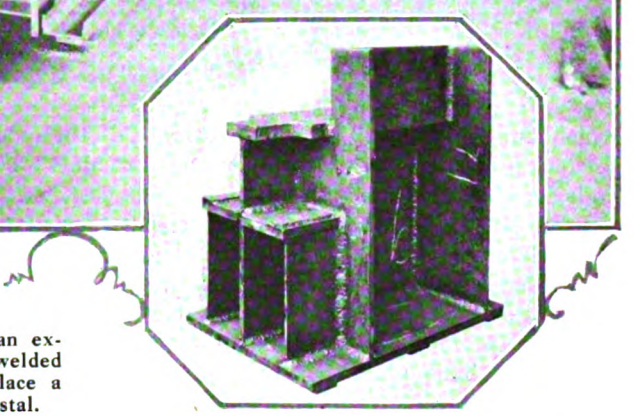


Fig. 7. At the right is an example of the use of welded steel construction to replace a casting used for a pedestal.

from any one of several steel warehouses. In the line of machinery illustrated, it is estimated that an inventory reduction of $75,000 was effected.

Great speed in the development of new machinery is possible where welded steel construction is used in place of castings. Machinery builders are painfully familiar with the fact that while the first few machines of a line look perfect when they go out on the job, the great inventiveness of the American factory foreman and operative frequently necessitates radical changes within the first year. The machinery builder feels the effects of these rapid changes very acutely and many times sees accumulated profits eaten up in radical changes which involve continual expenditures for new patterns. The machinery builder has to meet the payroll whether anything else moves or not so that his natural tendency is to hold back on making changes which he knows he will have to make sooner or later anyway. In many cases he waits until his competitor has given him a good drubbing, then he lets go of a substantial amount of money which he had hoped would be real profits and makes the change. The use of welded steel construction eliminates to a considerable extent the difficulties the management has in keeping the machinery line up to date. The drawing is merely changed, which automatically changes the bill of material specification and the part comes through production without further expense or delay.



Fig. 8. After being formed the joints of sheet metal containers are easily made tight by welding.

Special machinery, in spite of the best efforts of engineers and production experts to prevent its use, is being used in increasing amount. American management men want to throw raw material into one end of the plant at the intake of a machine and take out the finished product at the shipping platform. This necessitates special machinery and equipment. The use of welded steel construction in place of castings permits the machinery builder to meet production requirements with special machinery

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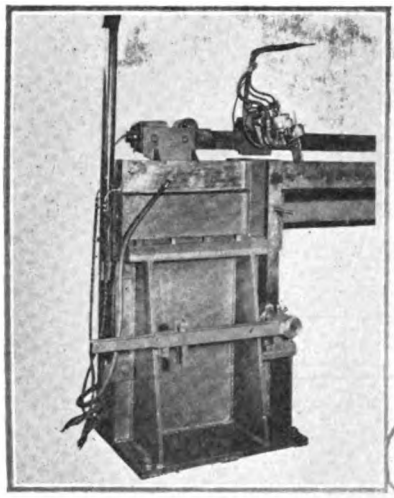


Fig. 9. The entire base and overhanging arm of this machine were made of welded steel.

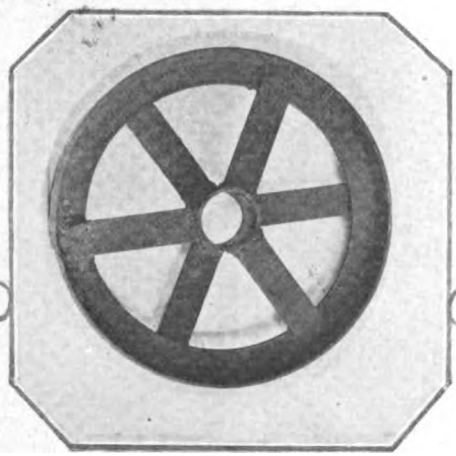


Fig. 10. All kinds of wheels such as this are now being made of welded steel in place of castings.

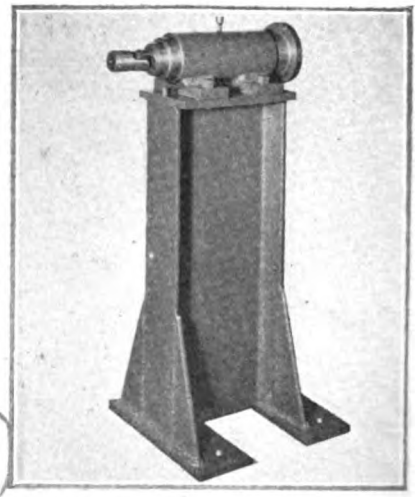


Fig. 11. Another example of the use of welded structural steel in machine construction.

which can be sold at a profit. Flexibility of the method permits practically any kind of special machinery being built for short deliveries without excessive cost.

From the viewpoint of the management of a machinery building plant, a great deal is to be gained by the use of welded steel construction. However, the introduction of this method takes a considerable amount of time owing to the fact that it is entirely new to a good many engineers. This time element is to be expected since all of the engineer's training has tended to make him very conservative in the adoption of practices which are apparently new. Actually the design of welded steel construction is fundamentally a series of problems in mechanics with which every mechanical engineer is entirely familiar. So far as the welding is concerned, it is merely a matter of fastening pieces of metal together by a process.

The use of welded steel in place of gray iron castings in machinery building is probably one of the ultimate effects of the policy established many years ago by the United States Steel Corporation and other large producers of hot rolled steel. This policy of making great capital expenditures in order to produce hot rolled steel at minimum cost has reduced the cost of hot rolled steel to such a point that cast iron has become uneconomical in competition with it. This in spite of the fact that hot rolled steel was cast iron before it was steel, and that considerable cost was involved in the conversion.

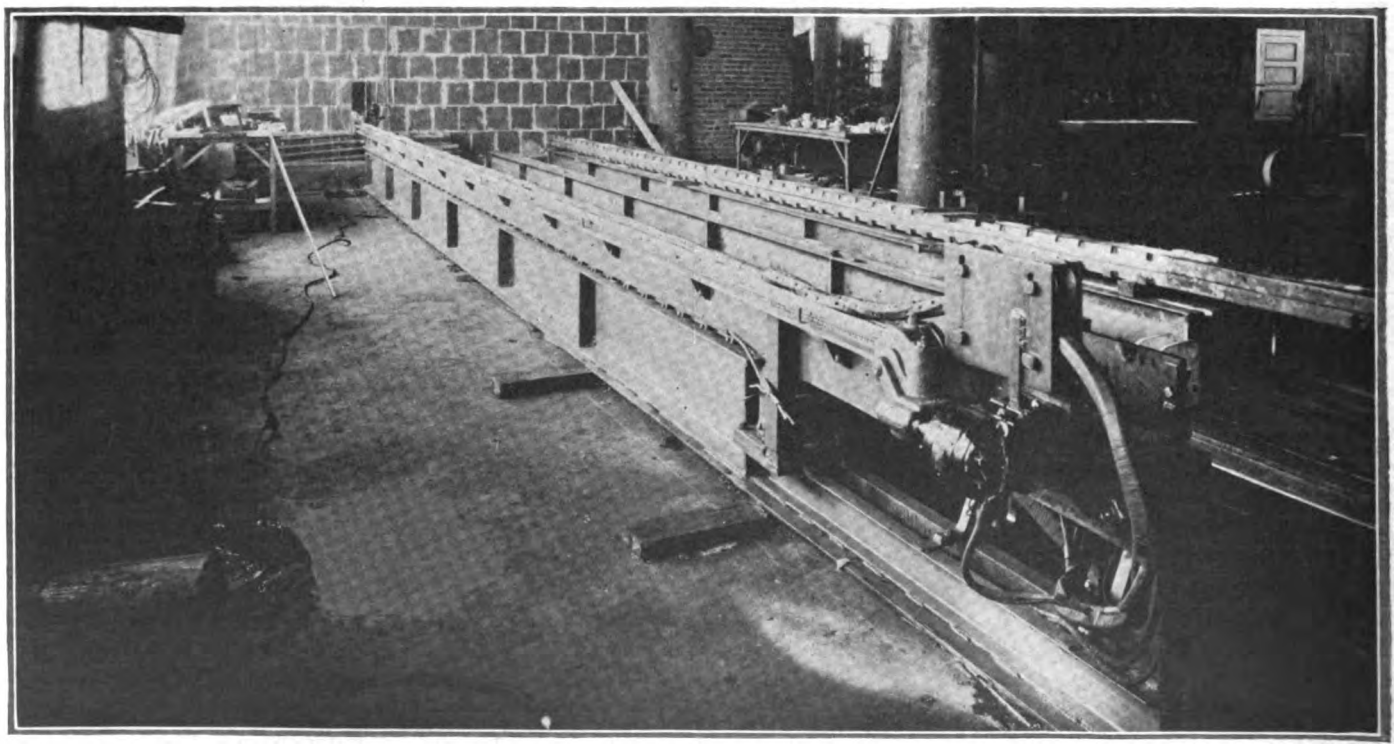


Fig. 12. The bed plate and many other parts of this machine, formerly made of castings, were built entirely of welded steel shapes.

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Air Lift Pumping Systems Have a Variety of Uses

By George Lee

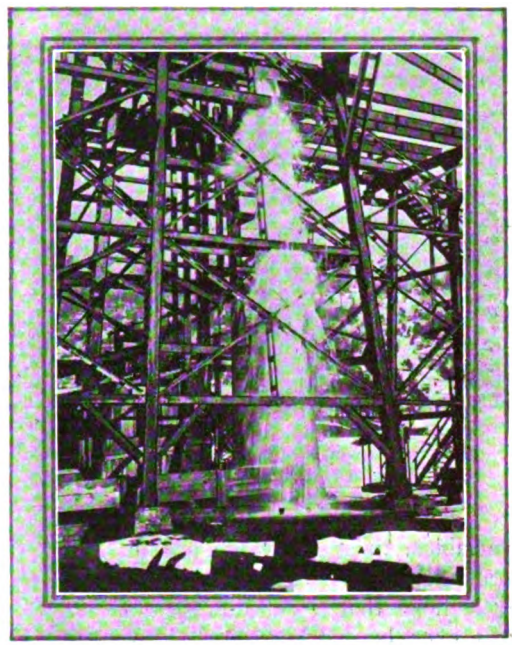


Fig. 1. An air lift pumping system in use in a mine at Roslyn, Wash.

THE air lift pumping system is an important method of raising liquids. If its operation were easily understood its application no doubt would be more common. Although it has for a long time been almost exclusively applied to raising water from drilled wells, its use in industry is now rapidly increasing and becoming an economic factor. It is often used for elevating liquids in chemical and manufacturing plants, unwatering mine shafts, pumping through boreholes, providing city water supply, etc. In such instances it has many peculiar advantages, especially when the liquid contains solids, grit, acids, alkalis or other corrosive or erosive materials.

Although the following treats upon the raising of water the same principles apply to the lifting of most liquids. In all cases the specific gravity of the fluid is an important factor.

By means of the air lift greater quantities of water may be raised efficiently from a deep inaccessible water area than by any other means. The equipment employed is unusually free from undue vexations and expensive breaks or depreciation. Under some special conditions to which the air lift is peculiarly applicable, its efficiency, when properly designed, is probably always much higher than that obtainable by any other pumping system.

Special Uses.—For emergency service the air lift also has great possibilities when used in conjunction with permanent pumping machines. It may be installed for regular or temporary service and prove unusually satisfactory because its initial and depreciation charges are relatively small. It may be used for emergency service when other equipment fails or becomes submerged.

For example, an air lift can be employed to advantage in a flooded area. The introduction of an air line into a conduit used for electric cables may often prove to be a worth-while emergency measure. Straight column lines of submerged pumps may be sometimes converted into air lift pumps by inserting an air line in the column pipe and providing the other simple devices that are necessary. In some instances, as an emergency precaution, it might be advantageous to provide air pipe attachments to column lines used by permanent mechanically-operated pumps. Should these units become submerged it would then be an easy matter to continue the use of the column line by making an air connection to it and locating a compressor at any convenient point above the water level.

Theory of Operation.—It is unfortunate that an attempt at a rational analysis of the theory of an air lift reveals so many

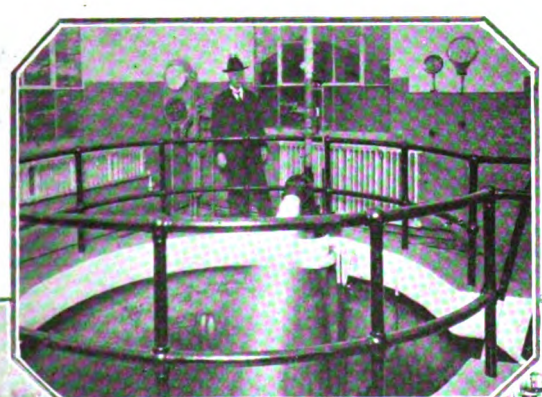


Fig. 3. The open sump pit of the Lodi pumping station. Water flows by gravity from the air lift operated wells into it.



Fig. 2. Equipment used for supplying starting air for the oil engines in the Lodi, N. J. water works pumping plant.

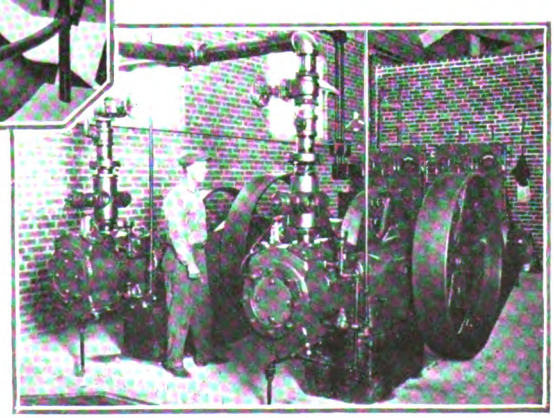


Fig. 4. Compressors used for supplying water to the municipal bathing pool at League Island Park, Philadelphia.

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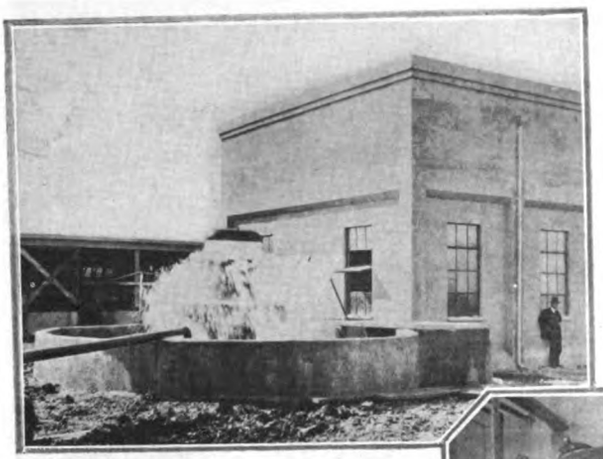


Fig. 5. The city of Santa Rosa, Cal., receives water from this air lift operated well.

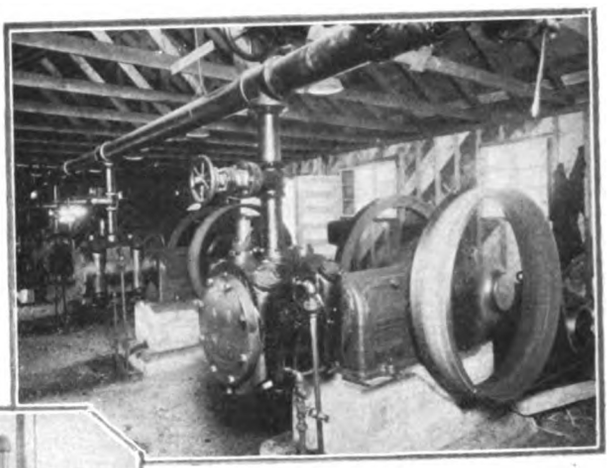


Fig. 6. In the Ogden plant of the Utah water works water is obtained from air lift wells.

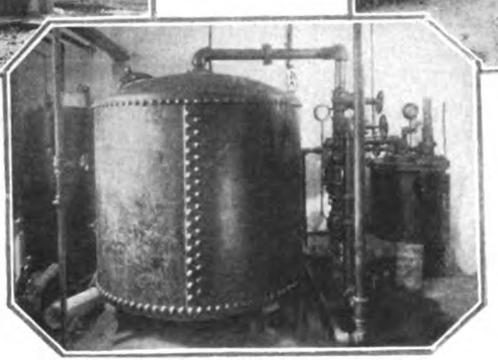


Fig. 7. A typical booster and filtering plant for use in conjunction with air lift wells.

variables, most of which are uncontrollable, that there seems to be little hope that a definite formula can ever be worked out. However, it is possible to determine certain characteristics about its successful design and thus better enable the user to interpret results and set up efficient systems.

In its simplest form the air lift operates by the introduction of compressed air into the bottom of a column pipe submerged in a body of water. It has no moving members in contact with the water and its efficiency is therefore not impaired by the wearing of such parts. A large air compressor located in any convenient position will supply several air lifts.

Losses.—The motive power of the air lift pump is the buoyancy of the air bubbles. Whatever slip actually occurs in the eduction pipe is consequently one of the chief losses of energy. It has been found that this loss varies as the square root of the volume of the bubbles. It is, therefore, desirable to reduce, by any *efficient* means possible, the size of the bubbles when they enter the eduction pipe.

If the difference in pressure between the air and water, where the former enters the eduction pipe, is small, the air will flow into the water at a low velocity. In the open-end type air lift footpiece (usually the home-made variety), the air must travel an appreciable distance toward the surface before it can expand sufficiently to produce a plugging effect and thus carry the water up with it. This is equivalent to a loss of submergence.

Other losses are due to the friction of the water on the sides of the pipe and also to the churning of the water as one bubble breaks into another. The best proportion and design for an air lift is consequently that which makes the sum of these losses a minimum. Often it is only by experimentation that we can determine what is the best proportion and design.

As a bubble of air travels toward the discharge outlet of the

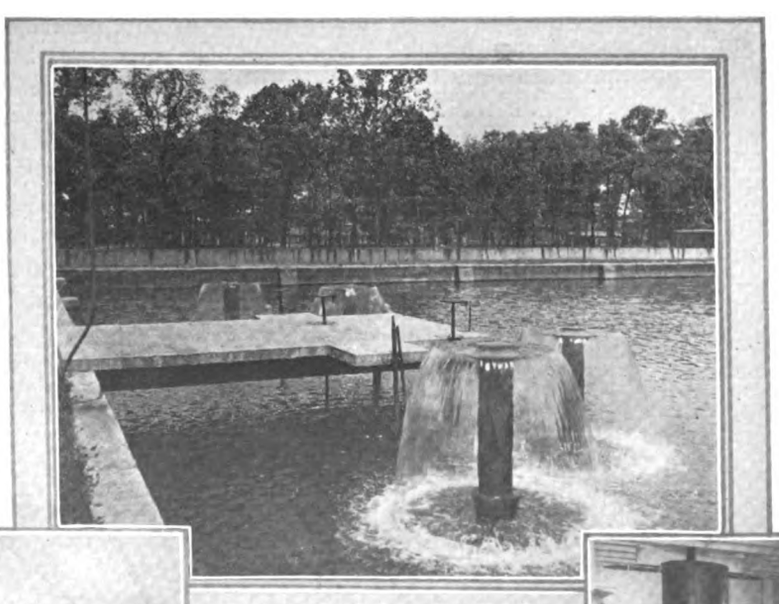


Fig. 9. Testing an experimental well on the plain near Amarillo, Texas.

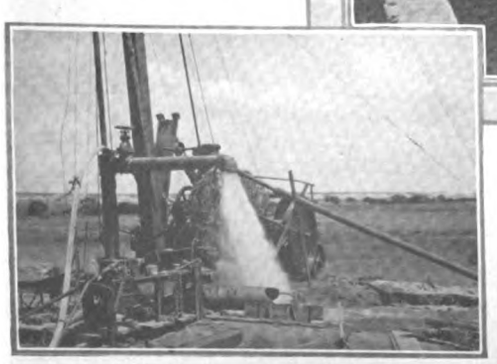


Fig. 8. Reservoir at Carthage, Mo., showing the discharge from two air lift wells

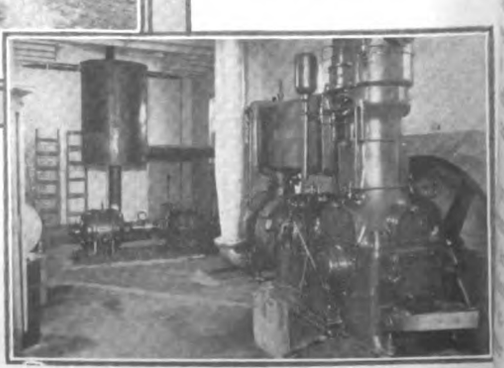


Fig. 10. Air compressor equipment in the Carthage, Mo., water works.

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Fig. 11. An air lift booster in a receiving basin of the Dubuque, Iowa, water works.



Fig. 12. Nearly 6,000,000 gallons of water a day from air lift wells pass over this weir at Dubuque, Iowa.



Fig. 13. A typical air lift discharge used in irrigation work near Clearwater, Fla.

air lift the pressure above it decreases and it must expand, as illustrated in Fig. 3. Being confined in a pipe it can do this most easily in a vertical direction, resulting in increased velocity and friction and also greater displacement in the eduction pipe.

The flow of a liquid in a pipe is retarded at the point of contact between the liquid and the walls of the passage-way. In this manner the water surrounding a bubble moving upward in an eduction pipe is relatively held back by friction until it slips behind the bubble. This slippage represents a loss of efficiency and is manifested in poorly operating air lifts by a varying or "plugging" discharge.

Pump Design.—In the design of an air lift it is well to remember that air under pressure is always seeking to expand, therefore any inequalities in the flow of water through the eduction pipe, caused by a change in direction of flow or due to pressures in the line, result in swirls or eddies which produce slippage. An absolutely smooth passageway is desirable for the air and water. Even a sharp change in the diameter of the eduction pipe will cause considerable loss.

Means are provided to obtain a complete mixture of air and water at the point where the air is introduced into the water and a particular bubble will start its lifting effect at once.

Air Velocity.—A velocity of 30 ft. per second is permissible in the air pipe. But the system should be arranged to allow sufficient expansion of the air so as to prevent excessive velocity at the footpiece. It is important to proportion properly the air and water pipes of all air lift pumps.

Air Receiver.—An air receiver is required in all air lift systems. It should be set adjacent to the compressor. Besides fulfilling the ordinary requirements of a tank for storing and equalizing the air pressure, the air receiver may act as a separator to take out a part of the moisture in the compressed air. For obvious reasons the receiver should be placed in a cool place.

Booster.—A booster or air separator may often be used to advantage on an air lift. It may be used to elevate the water above the normal discharge point, or force the water through a long horizontal pipe. A common type of separator consists of a simple shell or cylinder with a top and bottom. The mixture of air and water is discharged from the air lift into the top of the separator at a point a little to the side. The water leaves the separator from an outlet at the bottom and the air passes off at the top.

Fig. 14. A venturi meter and compressor in the Borough water works, Freehold, N. J.

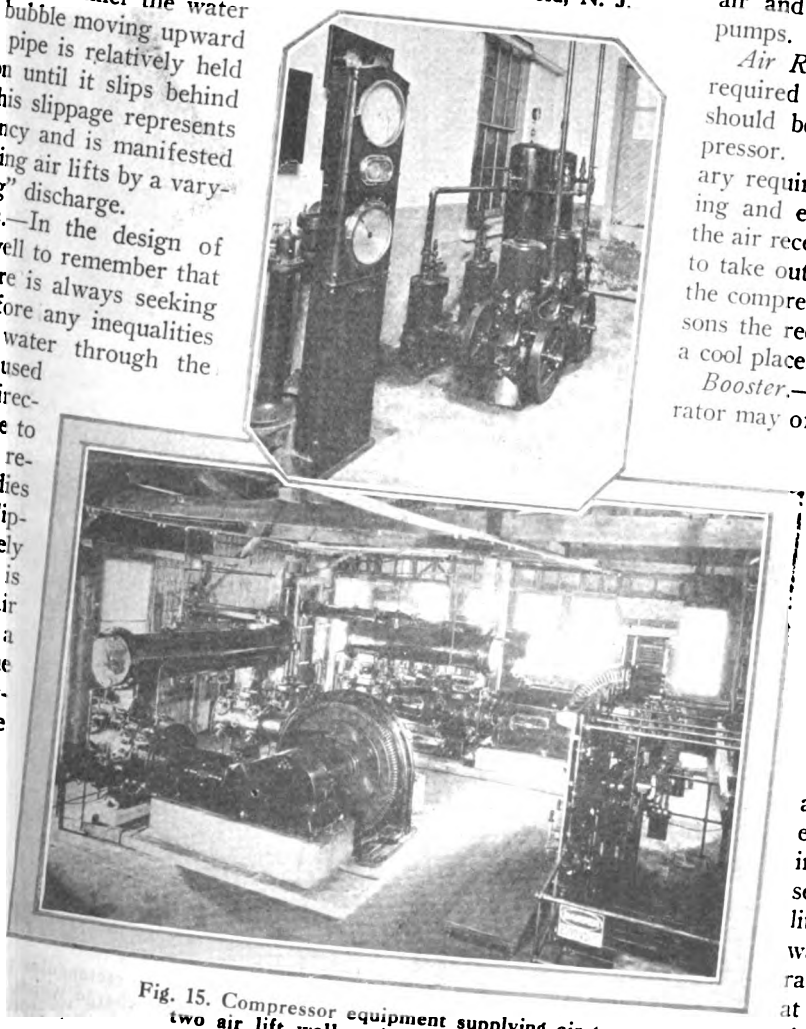


Fig. 15. Compressor equipment supplying air to two air lift wells using 4-inch air lines.

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Furnace Charging Trucks Increase Production

By Frank L. Eidmann

THE experience of the Reo Motor Car Company, Lansing, Michigan, offers an interesting example of the savings which may be accomplished through the use of the electric storage battery truck.

The carbonizing furnaces were formerly charged and emptied by a gang of men provided with long-handled tongs. This resulted in the loss of considerable time, in cooling the furnace so that the men could unload it. To cool it from 1,850 degrees Fahrenheit required about half an hour. Likewise when a fresh load of carbonizing pots was placed in the furnace, it required considerable time to bring the furnace back to the desired operating temperature.

Through the installation of a furnace charging truck, it is estimated that three hours are saved on each charge, considering the cooling time, unloading, charging, and raising the temperature. Also, six men are made available for other duties.

One truck load consists of seven pots which weigh approximately 350 pounds each. The pots are packed on two parallel trestles or tables so that the truck forks can be inserted under the pots. The elapsed time required for the truck to pick up the load, carry it to the furnace, have door opened, insert load, withdraw the truck, and to have the door closed, is only 1½ minutes—and there is no lowering of the temperature, or spilling of the pots. A single truck is caring for eleven furnaces, working two shifts.



Fig. 1. Charging a carbonizing furnace with a lift type electric storage battery truck. Two men now do the work formerly requiring five, and do it in considerably less time.

At the end of the furnace run the truck withdraws the pots, carries them to a steel bench and sets them down to cool, after which they are emptied by a chain hoist.

As a safety measure, two angle-iron guards have been built around the driver so as to prevent him from being pinned against the hot doors of a furnace across the 16-foot aisle as he backs out after loading or unloading.

The manner of doing this work and the different equipment used are shown in the illustrations.

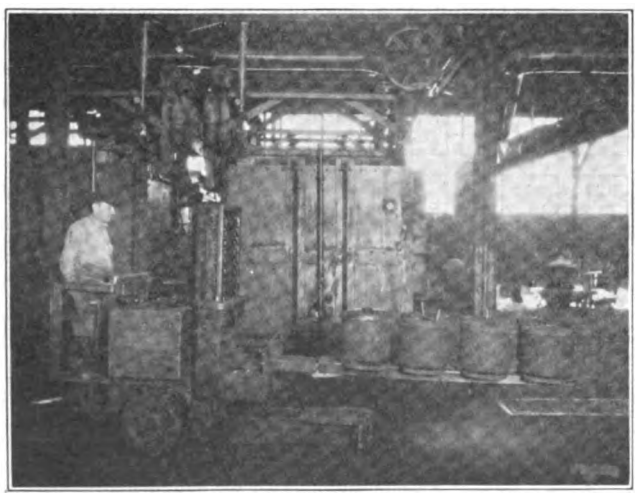


Fig. 2. Eight round carbonizing pots can be either placed in or removed from the furnace at one time by this furnace charging truck.

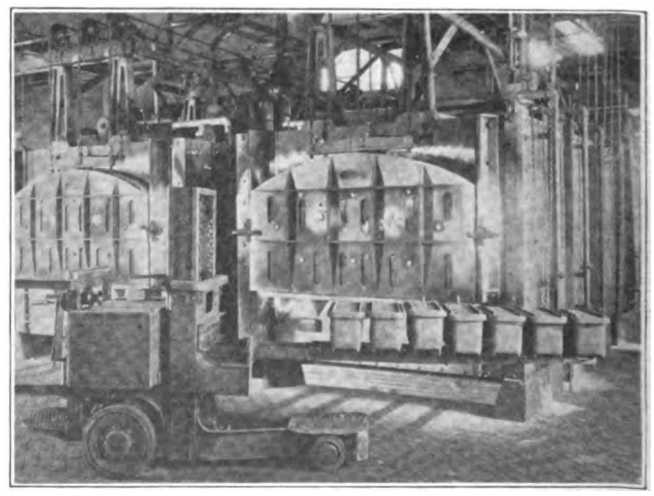


Fig. 3. When rectangular pots are used seven constitute a charge which are easily handled by lift type electric storage battery trucks.

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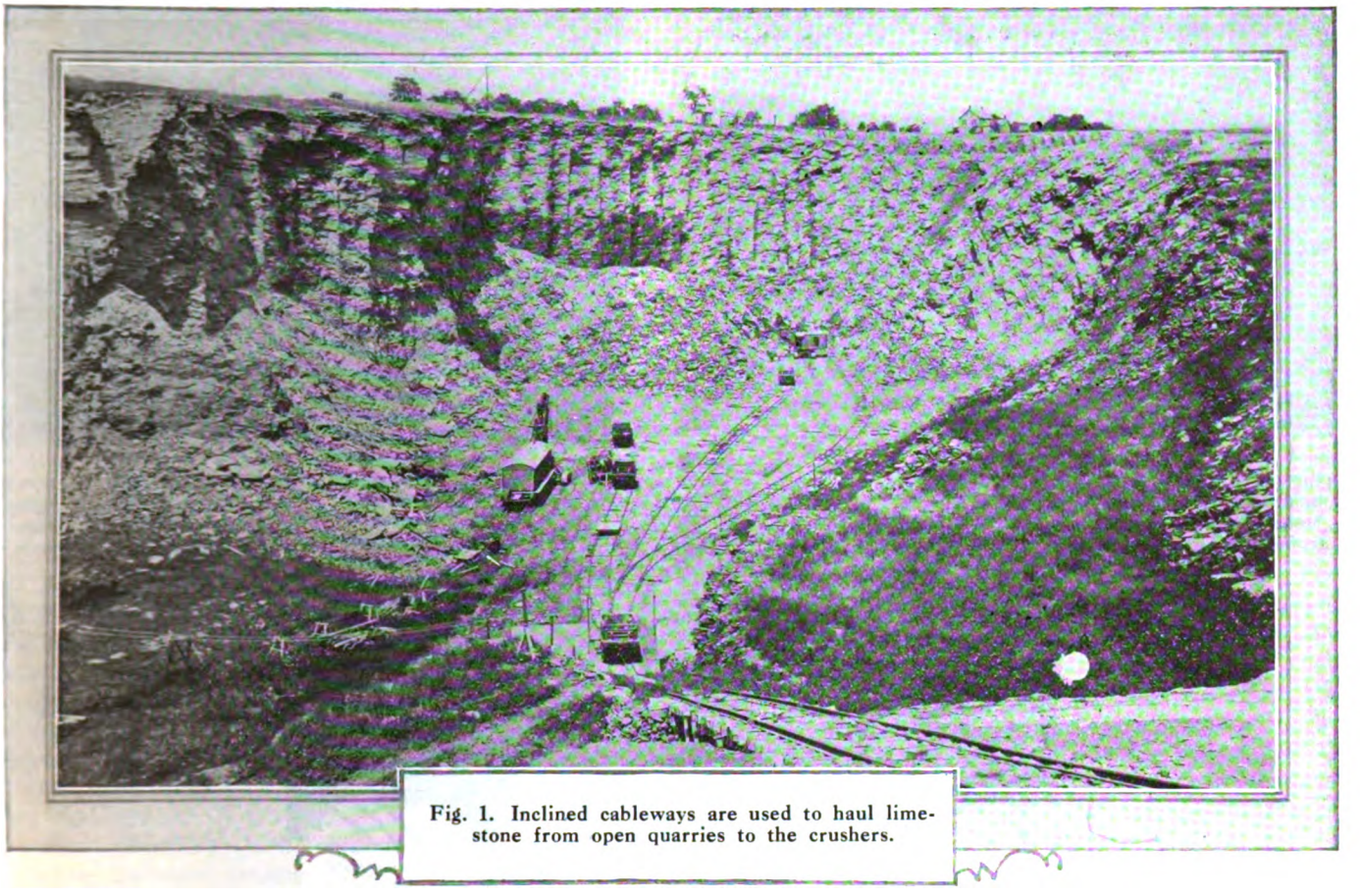


Fig. 1. Inclined cableways are used to haul limestone from open quarries to the crushers.

Materials Handling Problems of the Cement Industry

By Edward J. Tournier

A GREAT variety of equipment is required to make a product which will pass a screen with 40,000 holes to the square inch, from rocks as large as hogsheads. It also requires many kinds of mechanical handling devices to carry and lift the various materials used during the process of making cement.

Limestone must be conveyed from the quarry, and crushed and screened. Then limestone and shale must be proportioned correctly and delivered to the kilns.

Cement clinker is the product resulting from the fusion



Fig. 2. A tramway in use in a western cement manufacturing plant for transporting limestone to the crushers.

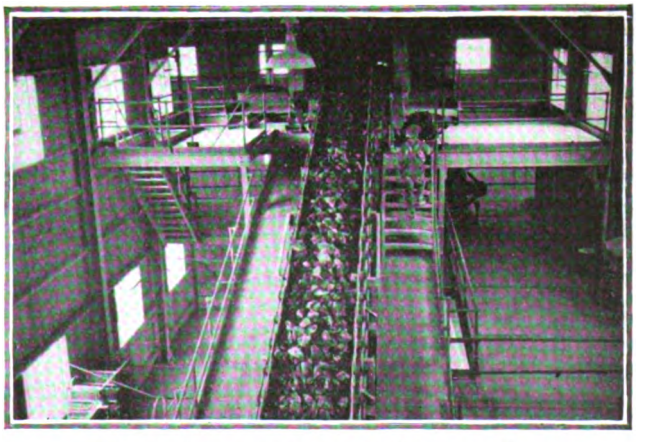


Fig. 3. Pan conveyors carry limestone from the primary to the secondary crusher in a mid-western cement plant.

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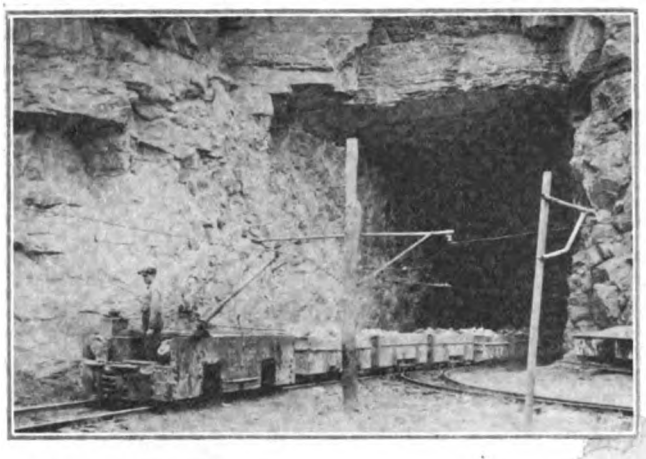


Fig. 4. Electric locomotives haul the limestone from underground mines. (Above)

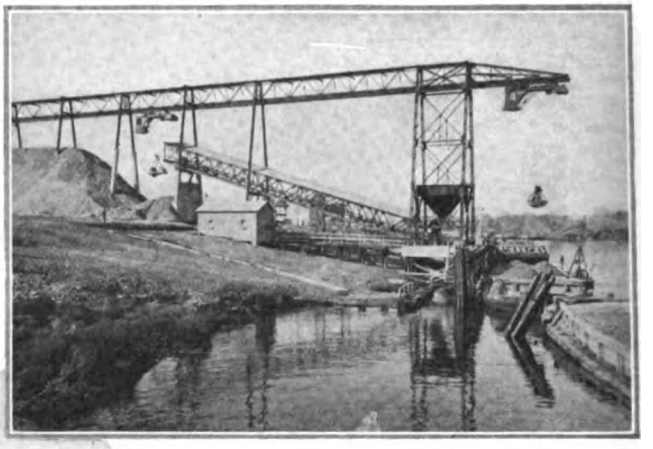


Fig. 5. Unloading limestone from barges by means of a monorail crane. (Above)

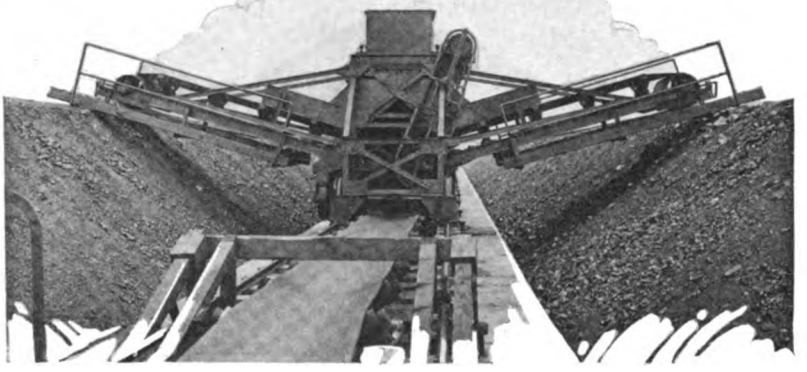


Fig. 5A. Storage piles are formed at each side of this belt conveyor by a special tripper. (Above center)

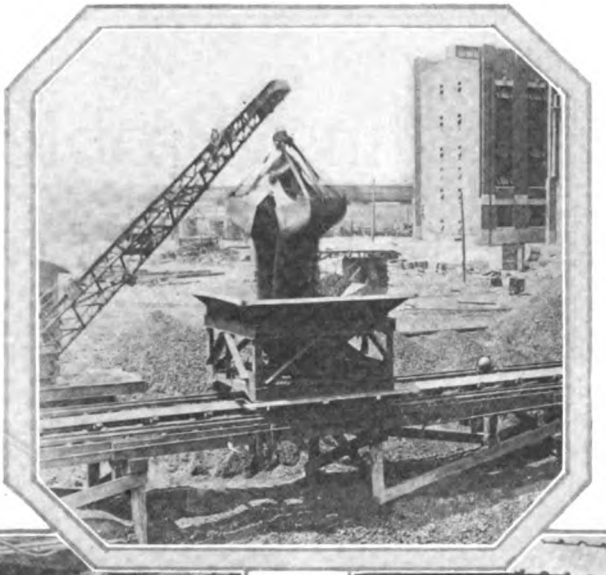


Fig. 5B. Transferring material to a belt conveyor by a locomotive crane. (Left)

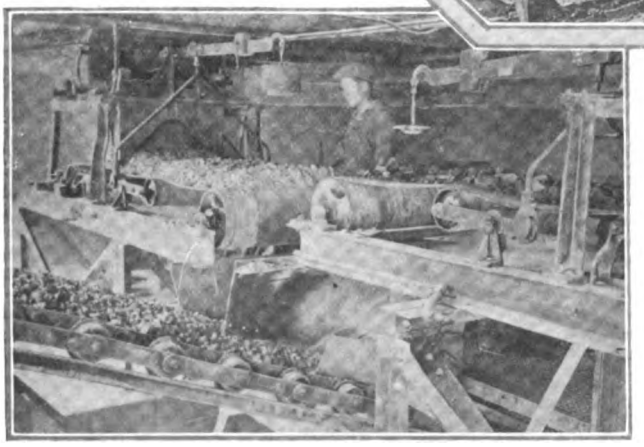


Fig. 6. Proportioning ra... terials by the use of a poidometer. ...s are determined as the sl... e pass over the

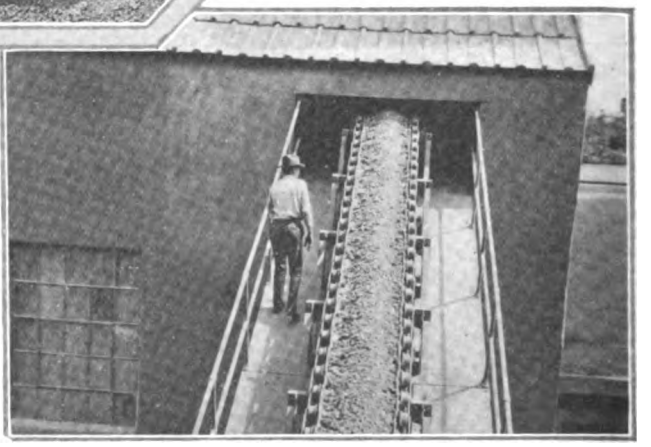


Fig. 7. Crushed limestone and shale weighed out in proportions for the cement mixture are carried by this apron conveyor to the grinding mills.

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Fig. 8. Cast iron pan conveyors mounted on chains carry white-hot clinker from the kilns to the coolers.

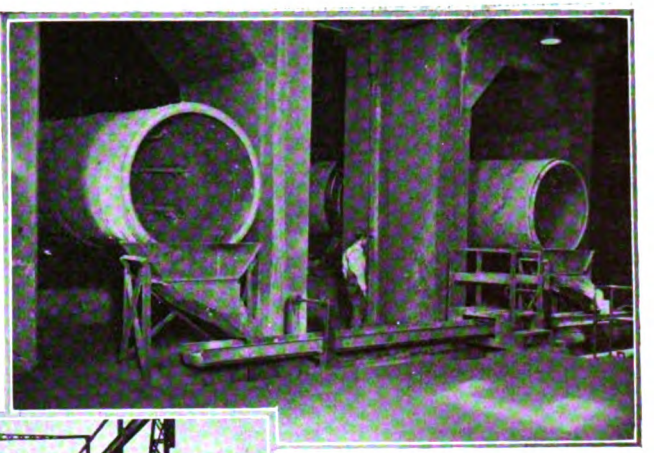


Fig. 9. Clinker drops from the coolers into the long steel trough which is a shaking conveyor.



Fig. 10. Clinker and gypsum storage of a cement plant in the southwest. (Above)

Fig. 11. Pivoted bucket carriers are used for conveying clinker to and from storage. (Below)

of the raw materials. It presents a two-fold handling problem. First it must be carried at white heat to the coolers. After cooling it must be conveyed and elevated to storage. From storage the clinker is taken to the grinding mills, and the finished cement placed in silos for setting before shipment.

In taking out limestone from open quarries, steam shovels and industrial cranes are used in many instances to transfer the material to an inclined cable way, thence to the crushers. In some instances the limestone is obtained by underground mining, and gasoline operated shovels are used to pick up the stone. Electric or gasoline locomotives haul the mine cars from the mines to the crushing plant.

When the cement factory is distant from the crushing plant, the raw materials must be brought to the factory and stored until needed. The transfer may be made from storage either by rail or by water.

If shipment from the crushing plant is to be made by rail a bin is used for car loading. Any existing surplus is stocked out in ground storage by a belt conveyor and a special tripper. Reclaiming from the storage may be accomplished with a locomotive crane.

When shipment is made by water, stone is loaded into barges by means of boom loaders carrying conveying belts. The barges are unloaded at destination by means of locomotive cranes, telphers or hoisting towers.

The unloading of cars may be accomplished by overhead buckets or by means of a track hopper, feeder and a conveyor.

Stone and shale must be correctly proportioned by means of continuous weighing devices. Two short belt conveyors

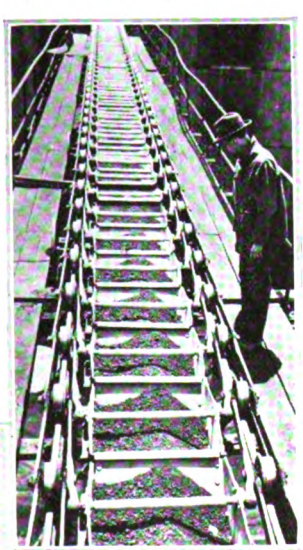




Fig. 12. A pivoted bucket carrier as it is used for handling clinker for storage.

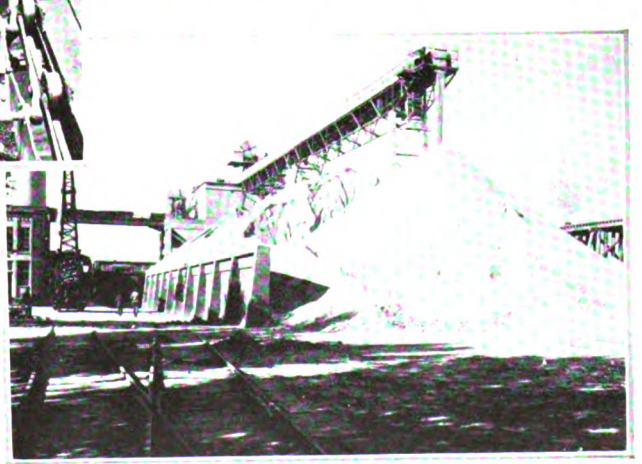


Fig. 13. Belt conveyors are also used for storing bulk materials in cement plants.

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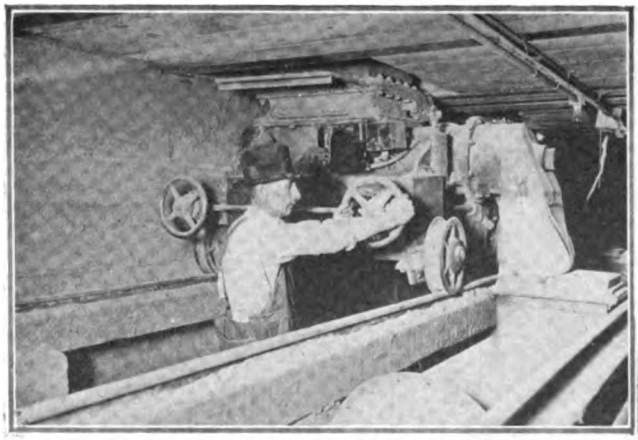


Fig. 14. A screw conveyor transferring cement from storage bins to another long screw type conveyor.

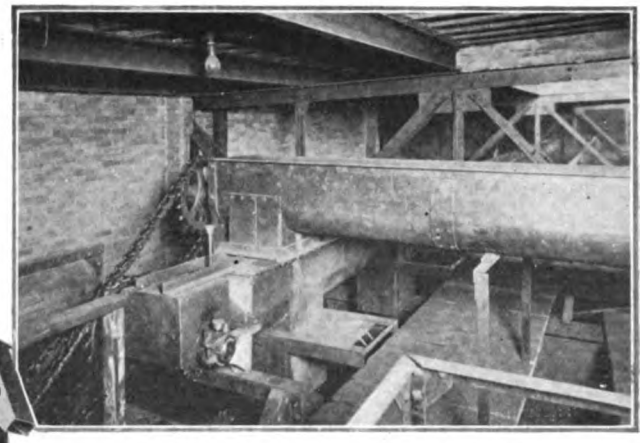


Fig. 15. Screw conveyors require little head room and are made dust-tight.

have troughing rolls carried on the levers of special scales, and the scales are arranged so that material weights are registered automatically in transit. The two kinds of material are discharged to a central conveyor, which carries them to the kilns.

The calcining process produces cement clinker which comes out of the kilns at white heat. This clinker must be conveyed to coolers before the grinding process can take place. Cast iron pan conveyors, mounted on steel chains are used for handling the hot clinker. There is also a new type of conveyor without chains for this purpose. It consists of a long trough carried by a series of pendulum arms. One end of the conveyor is actuated through a flywheel and propels the material forward by intermittent jerks.

Cement clinker that has been cooled is usually placed in storage until needed, by means of overhead traveling cranes, pivoted bucket carriers, belt conveyors or telphers. The overhead cranes may be used both for storage and reclaiming, while the belt conveyor requires some kind of an auxiliary such as a locomotive crane for this purpose.

Finished cement is also placed in storage until ready for packing. Screw conveyors are used for this purpose because of the small space required for their operation and also because they are easily made dust-tight.

(*Continued on page* 26)



Fig. 16. Centrifugal discharge elevators with buckets carried on chains or on belts are used extensively for handling cement. (Above Center)

Fig. 17. Unloading raw material from freight cars into the boot of a bucket elevator by means of a power shovel. (Below)



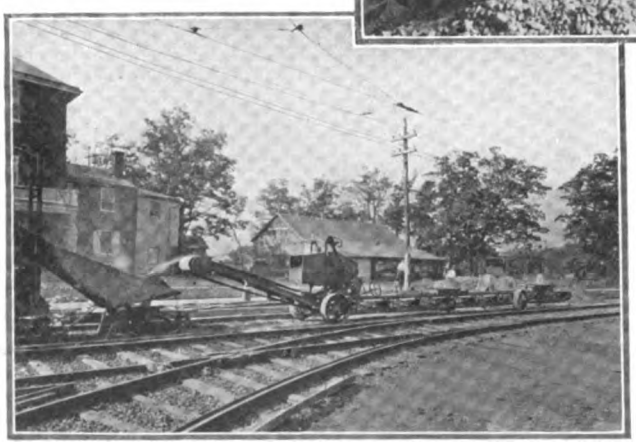


Fig. 18. Transferring materials from storage piles to a concrete mixer by a belt conveyor.

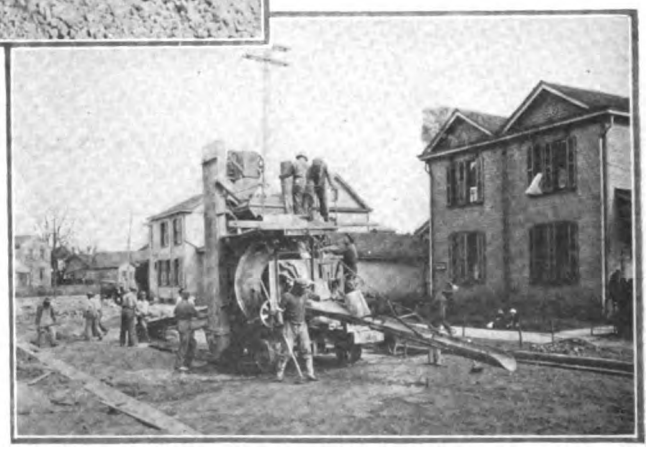
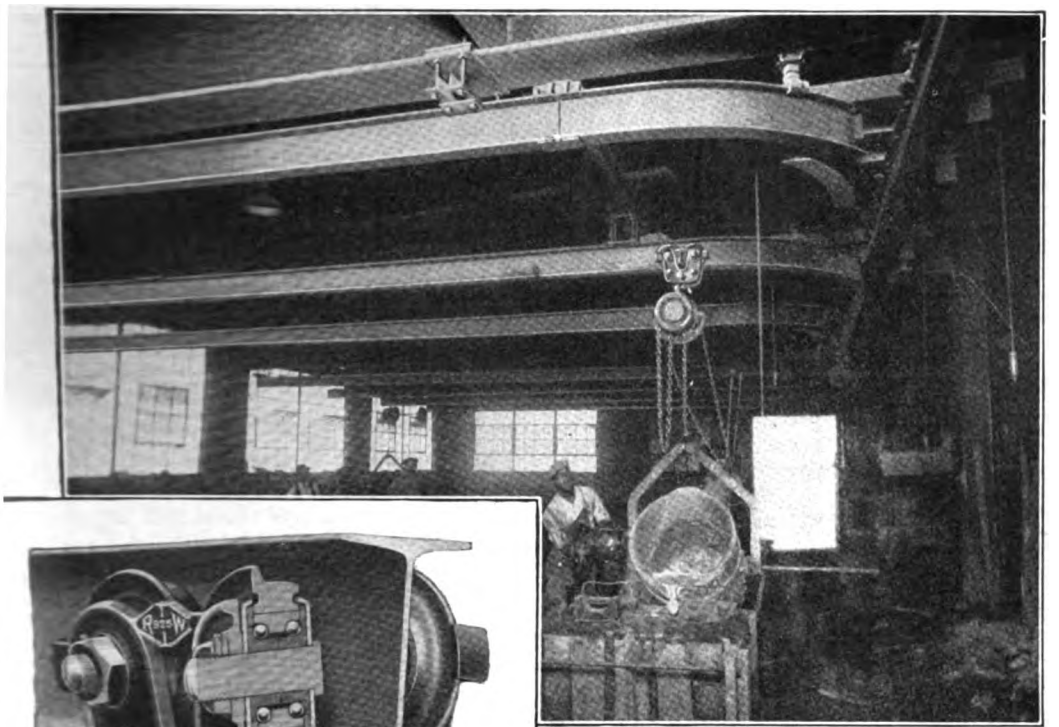
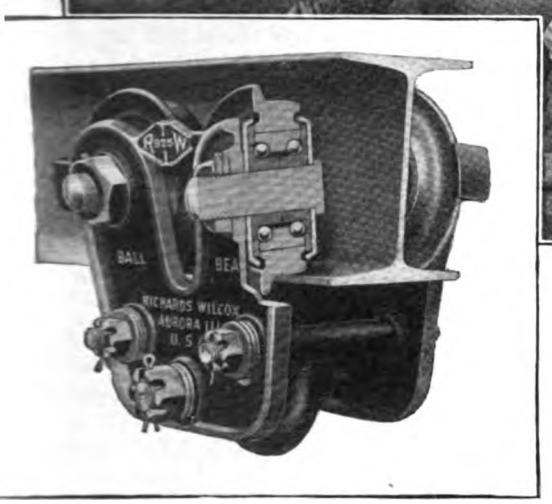


Fig. 19. With this concrete mixer several forms of handling equipment are used to place the raw materials in the machine.

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Cuts Labor Cost 2/3— One Man Replaced Three

R. S. Conant, Gen'l Mgr., Nepperhan **Foundry, Henry Donahue, Owner, Yonkers, N. Y., says:**

"When we built our present foundry for casting sash weights, we installed a Richards-Wilcox OveR-Way system for handling our 2,500 lb. ladles from the cupola to the moulding floor.

"The cupola is located in the center of the foundry. Our main I-beam track line runs in front of it and extends in both directions. Switches lead to 8 tracks, 36 ft. long, located at 12 ft. intervals, for carrying the ladles to the 8 moulding lines for pouring. Four Richards-Wilcox No. 925 1½-ton OveR-Way ball bearing trolleys carry 1½-ton chain blocks for handling the ladles.

"This arrangement is very economical, efficient, and flexible. The ball bearing trolleys permit moving the heavy ladle with a minimum of effort. The track can be extended in either direction to accommodate growth in the foundry.

"In casting the sash weights, approximately 800 lbs. of metal are poured in each flask. We pour 25 to 30 tons a day. The 2,500 lb. ladle can be handled by one man, which is unusual for this work. We formerly required 3 men to a ladle, so we are saving 2 men over our previous method.

"The Richards-Wilcox I-beam track is very well adapted to this class of work, because it is easily accessible and cannot become clogged with dirt. The only maintenance required is to clean and oil the trolleys every few days. The system has worked out so well that we contemplate using it in our warehouse now under construction."

R-W No. 925 Ball-Bearing I-Beam Trolley sent for

FREE TRIAL

So confident are we of the ability of the R-W No. 925 Trolley to render superlative service that we will gladly send it to any reputable manufacturer for free trial. Such a trial involves no cost or obligation, for if the trolley fails to demonstrate its superiorities under actual working conditions you have only to send it back at our expense. This offer, we believe, is far stronger than any claims we can make. R-W No. 925 is made in seven capacities —¼ to 4 tons. Ask for this FREE trial.

Richards-Wilcox Mfg. Co.

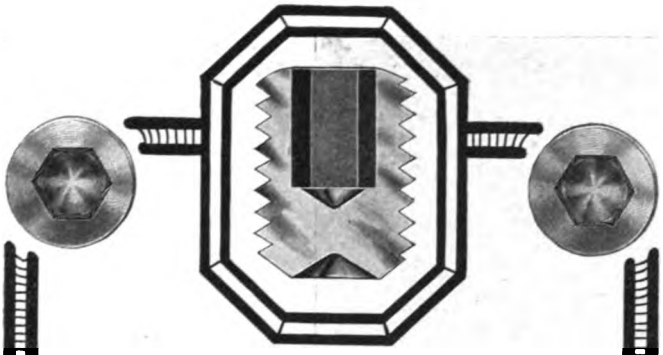
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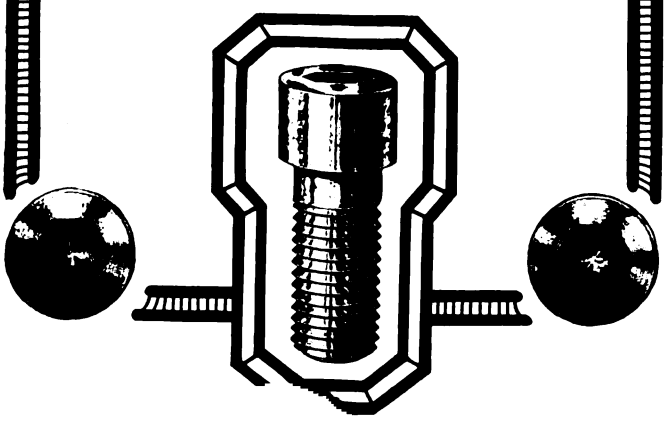
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W. J. McRae
320 Market Street
San Francisco, Cal.



Materials Handling Problems of the Cement Industry

(*Continued from page 24*)

From the grinding mills, the screw conveyor or belt conveyor carries finished cement to a bucket elevator which discharges to a screw conveyor over the silos. Slide gates in the bottom of the conveyor trough permit of discharging material at any point.

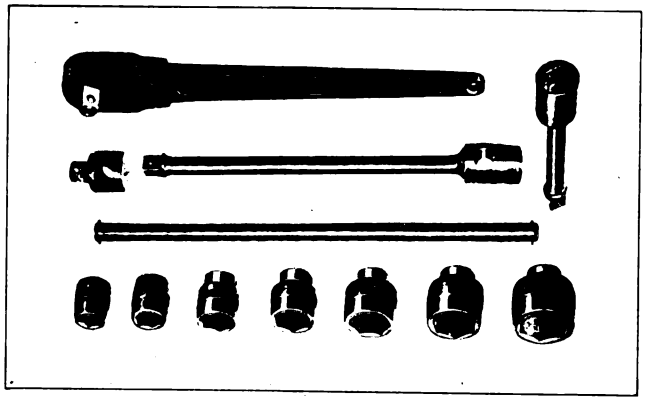
Usually finished cement is packed in bags for shipment but in some cases time is saved if it is shipped in bulk. In such instances delivery is made in box cars. The latter are unloaded by means of power shovels, into the boot of a bucket elevator. The elevator discharges into a screw conveyor which in turn delivers into silos. On large construction work, time spent in opening and dumping cement bags is saved, as is also the sorting and counting of used sacks.

In the construction of concrete roads and streets great savings may be made by conveying the cement and other aggregates to the mixer, instead of wheeling them in barrows. Incidental to cement handling, the conveyance of wet concrete is becoming standard practice on construction work. Belt conveyors are being used to place concrete in forms, and more recently they are being incorporated with portable concrete placing towers. The tower is equipped with an inclined belt conveyor which receives its load from the hoist bucket.

In the design of cement block plants, bucket elevators and belt conveyors are being used in cement handling. Compact units similar to the road making installations are in process of development. It is safe to say that from stone quarry to concrete, the cement industry is being thoroughly conveyorized.

A Heavy Duty Industrial Wrench Set

THE Blackhawk Manufacturing Company, Milwaukee, Wis., has recently introduced a new heavy duty industrial wrench set, the component parts of which are shown in the accompanying illustration. As may be noticed it consists essentially of a ratchet handle, or lever, the usual sockets, and several extensions. It was



A Heavy Duty Industrial Wrench Set.

designed especially for use on work requiring unusual strength combined with extreme lightness in weight. The sockets are furnished to cover a wide range of bolt, nut and cap screw sizes, and with the use of the extensions almost any desired wrench-arrangement may be had.

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Tips on Tooling

The Final Question

By H. P. Bailey, Assistant to the President, and M. E. Lange, Production Engineer

The Warner & Swasey Company, Cleveland, Ohio

ONE of the many problems confronting the executives in the metal working field relates to the purchase of new equipment. The great development in metal working equipment in the last few years is quite generally recognized, and yet when the production executive is considering improvements in tooling, he may properly ask the final question: "Will the increased production pay for the cost of the equipment, and also give a substantial profit on the investment?"

The experienced manager recognizes the advantages of "better methods," but he knows the conditions are often changing from day to day in his shop, and that many times apparently well planned improvements fail to produce the expected results. Moreover, the money available for such improvements is often limited and before authorizing any expenditure the production executive wants to know:

1. What average saving the new equipment will make over a period of time, under the exact conditions in his shop?
2. What the proposed tooling equipment will cost?

The great difference in the quantity of work produced in a lot in the different shops immediately suggests one answer for the small and average lot producers, and another for the quantity producers. Let us first consider the average shops where work is produced in small or average lots of five to one hundred pieces, and study an actual case, the production of the spider hub illustrated in Fig. 1, in lots of fifteen pieces. This is a steel forging requiring the finishing of two faces and the boring and reaming of the hole through the hub.

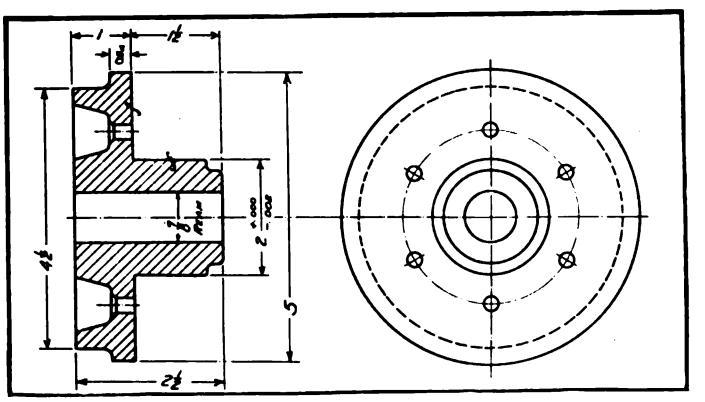


Fig. 1. Details of a spider hub used to illustrate tooling methods described in this article.

In order to obtain an answer for the average shop, let us compare definitely the production and cost of a typical homemade set of chucking tools and a universal equipment. Only by studying exactly the "former method" and the "better method" can we really come to a convincing conclusion which will obtain the approval of the chief executive. Then we will present the facts and figures for this particular installation and give in summary form the definite answer for the small lot producer in general.

This set of chucking equipment, illustrated in Fig. 2 and Fig. 3, is typical of well developed "shop made" tools designed by the foreman, and will handle a fairly wide variety of work and permits the use of "combined cuts." However, this homemade set will not give "multiple cuts" from the turning heads, and is not very rigid.

The same job is shown in Fig. 4 and Fig. 5 on the same turret lathe, equipped with a standard, universal set of overhead piloted tools. The two standard multiple turning heads will hold boring cutters as well as several angle cutter holders. In this way "multiple cuts" may be obtained from each tool.

The difference between the homemade and standard tool is shown clearly. The positive support of the overhead piloted bar gives rigidity for heavy feeds. The

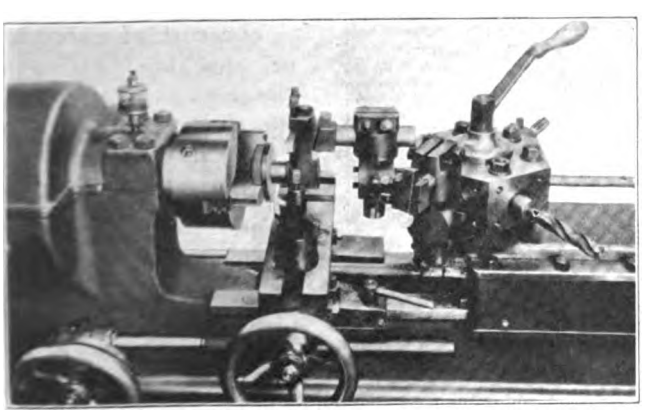


Fig. 2. Homemade set-up arranged for machining spider hub shown in Fig. 1.

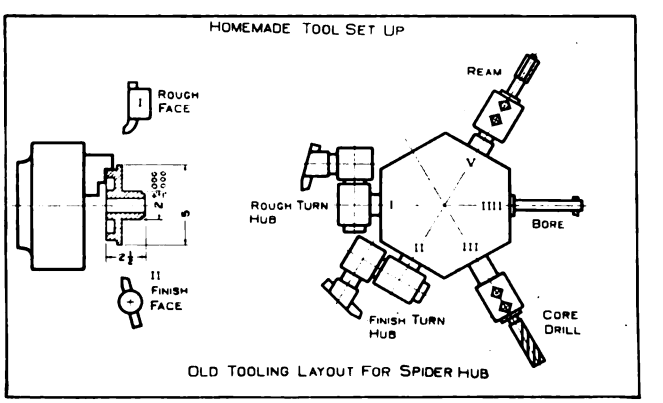


Fig. 3. Diagrammatic layout of homemade tool equipment shown in Fig. 2.

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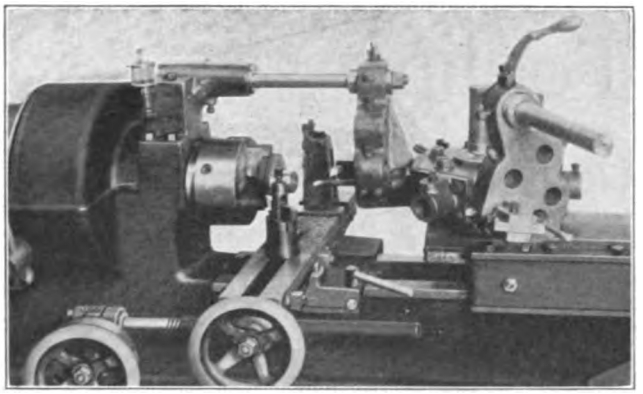


Fig. 4. Actual set-up of universal tool equipment proposed for machining spider hub shown in Fig. 1.

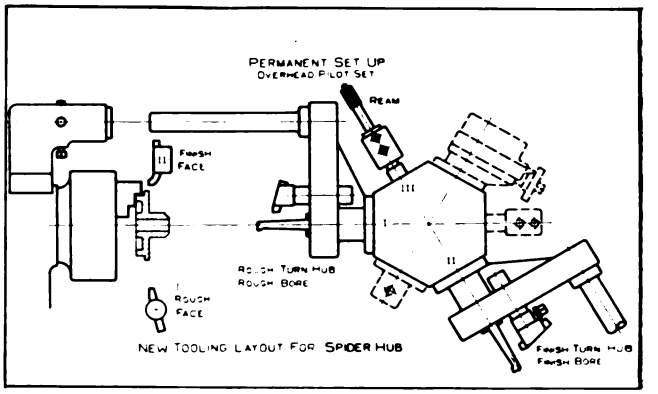


Fig. 5. Diagrammatic layout of universal tool equipment for machining spider hub shown in Fig. 1.

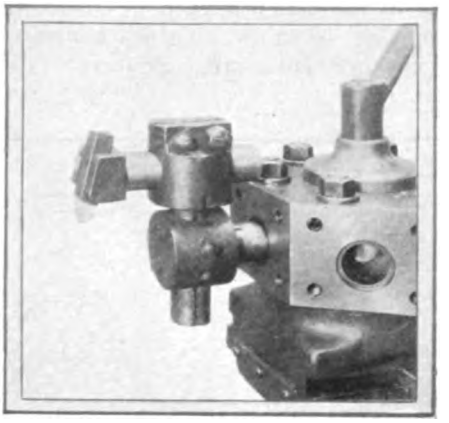


Fig. 6. Original homemade turret tools for finishing the forged steel spider hub shown in Fig. 1.

set-up time for this universal chucking equipment is slightly less than for the original homemade equipment because of the definite provision made for positive adjustment of cutters in the tools.

A comparison of the operations necessary to produce this spider hub with the original equipment and with the universal tooling equipment emphasizes the increase in production commonly gained from the "better method."

Even on a simple job like this the time was cut from five to three. The feed for the roughing cut is increased from .008 in. per revolution with the home-made tools, to .013 in. with the universal equipment, because of the piloting. The production time is reduced from ten to seven minutes.

The set-up time, which is a very important factor in small lot production, is slightly less for the universal equipment, and on many other types of work will be found to be considerably less because of the permanent set-up.

The set-up time, which is a very important factor in small lot production, is slightly less for the universal equipment, and on many other types of work will be found to be considerably less because of the permanent set-up.

The Facts and Figures for the Average Shop

The example of this adjusting sleeve, shown in Fig. 9, was suggested by the foreman of the shop involved, as a conservative example of savings realized through the use of universal tooling equipment for small and average lot work. Let us reduce to definite figures the value of the increase in production in this shop, as compared with the exact cost of the tools.

I. The average saving per day: the average saving in production time with the universal tooling equipment in this shop is 30 per cent. While different shops will always use different rates, let us assume an average basis and estimate the saving in dollars and cents.

With 60c for labor, and 90c for factory overhead, or $1.50 per hour, the charges for one machine per 8-hour day are $8 \times \$1.50 = \$12.00$

The average saving with this equipment is 30 per cent. of $12, or .....$ 3.60

II. The cost of the equipment: The exact cost of this equipment is $307. It will therefore take the following time to pay for the equipment:

$$\frac{\$307 \text{ (cost of equipment)}}{\$3 \text{ (saving a day)}} = 85 \text{ days of full time operation.}$$

After the equipment is paid for in 85 days, the investment will earn:

$$\frac{\$3.60 \text{ (saving a day)} \times 280 \text{ (days a year) or } \$1008}{\$307 \text{ (cost of equipment)}} = 328 \text{ per cent. a year.}$$

We may then give our answer definitely to the final question of the production executive as follows:

For small and average lot production a set of universal tooling equipment will cut production time from 15 per cent. to 40 per cent.

The cost of either bar or chucking equipment for 16 to 18 inch size machines will vary from 15 per cent. to 22 per cent. of the value of the machine.

The increased production will pay for the new tooling equipment in two to six months, and after that give an annual net profit of 150 per cent. to 400 per cent.

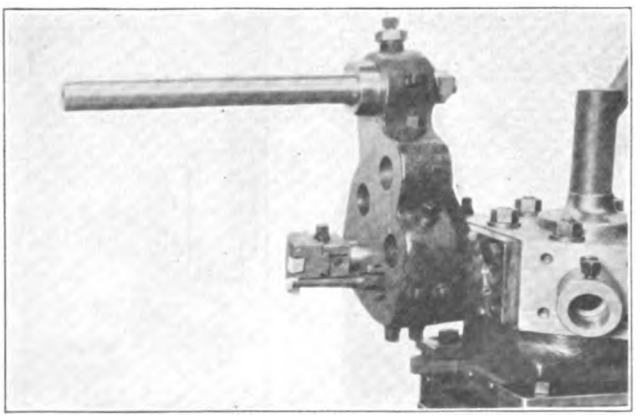


Fig. 7. Universal turret tools proposed as better for finishing spider shown in Fig. 1.

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'he Answer for the Quantity Producer

'he problem of the quan- producer is somewhat erent from that of the ıll lot producer. The iculty is to increase pro- :tion with tooling equip- nt which can be used for ong period of time in te of changes in the pro- :tion. The greatest ad- ıtage of universal tool- ; equipment for the quan- y producer lies in the xibility of the tooling, ıich results in a greatly duced tool cost over a riod of years.

A Typical Case: The First Method

In order to illustrate how ol cost may be reduced ırough the application of better methods" let us ompare two layouts for the ame job, a cast iron adjust- ng sleeve. The first method mployed special tools en- irely. The "better method" ı s e d standard universal ools wherever practical.

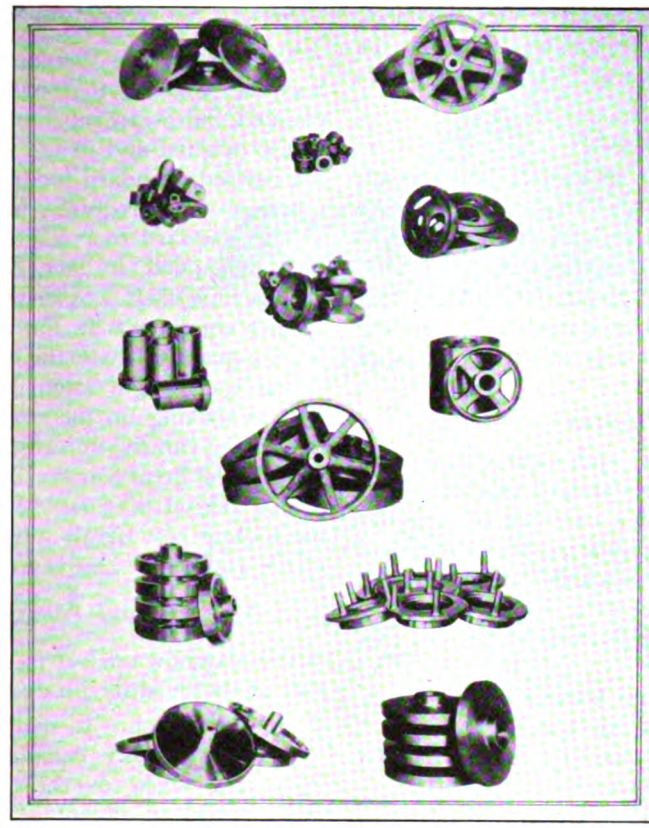


Fig. 8. Assortment of work adaptable for machining with equipment shown in Fig. 4.

The first layout shown in Fig. 10 was made by the ool designer for making the adjusting nut in large quan- ities. This designer was one of many in the engineering department who prepared the original layout and then submitted it to the chief engineer. Two special turning heads are provided to finish the outside diameters and the hole. An oil groove is recessed with a special eccen- tric tool. The necking and rough facing are done from the cross slide with a special block, so that the only standard tools a r e the reamer and the rear tool post.

The chief tool engineer then proceeded to revise the designer's original tooling layout as follows:

First: A brief study was made of the standard, universal tools available from the maker and suitable for this job.

Second: In order to solve the problem of concentricity, overhead piloting was decided upon to give the necessary rigidity.

To get four multiple cuts with one standard turning head, it was decided to make a simple, special multiple cutter holder. Detailed dimensions f r o m manufacturers g a v e the clearance diagrams, together with the information necessary to do this without tool interference.

The use of special blocks on the cross slide was so established in this plant that the possibilities of universal types of tools for this purpose were overlooked in the first discussion. Later an examination of the layout was made in an attempt to find a substitute standard tool which would give the same combined cuts.

Further information from the manufacturers finally suggested the use of a universal cross slide cutter block, at a cost equal to that of the original special block.

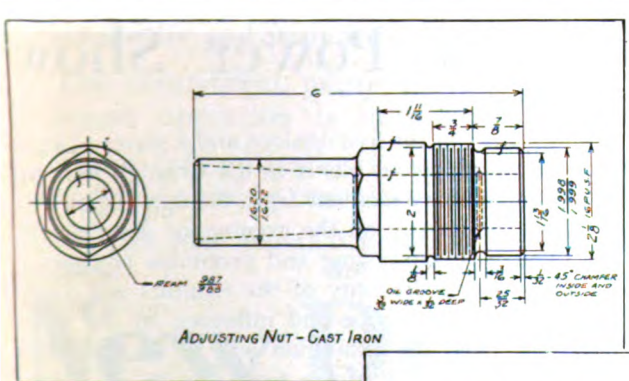


Fig. 9. Details of an adjusting sleeve used to further illustrate tooling methods. (Above.)

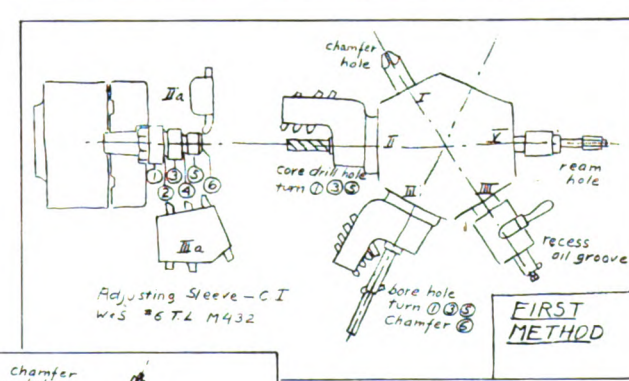


Fig. 10. Original tool layout (above) for finishing adjusting sleeve.

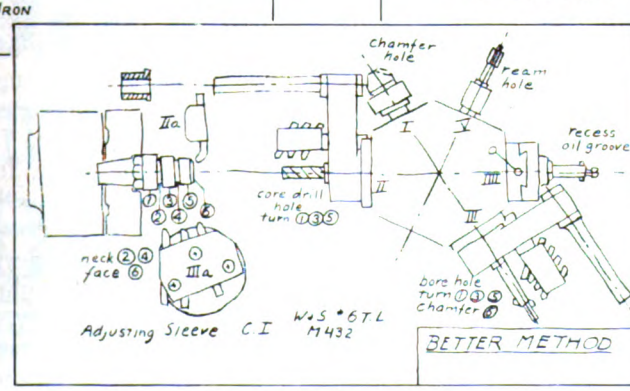


Fig. 11. Revised tool layout (left) for finishing adjusting sleeve.

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From these suggestions it was evident that the block could be shifted into four different positions on the cross slide, hence its use on different jobs in the future was assured.

The Better Method

The new tooling layout shown in Fig. 11 is the result of these changes. The only special tools now used are the chuck jaws, the multiple cutter holders for the turning heads, and the center piloted boring bar. The total cost of the tooling equipment is about the same as that of the original layout, but the "better method" of tooling may be used again and again for a great variety of other work.

Facts and Figures

The advantages of using tool equipment which is as flexible in its application as the standard machine itself are obvious. Before leaving this example of quantity production, however, let us summarize the direct and indirect results of using "better methods" in the revised tooling layout, in order to arrive at a definite summary of the dollars and cents saved, regardless of the tool cost.

Increase in production: through heavier feeds because of greater stiffness, the output per year was increased to the value of.....	$303
Saving in scrap: this was reduced from 1,000 to 200 pieces a year, because work could clean up better on the grinder. This saving amounts to 800 x 15c, or.....	120
Saving in grinding time: through less stock being left on for grinding, .01c each was saved on 215 pieces a day, or $2.15. With 280 days in the year, this amounts to 280 x $2.15, or.....	602
Total saving a year in dollars was.....	$1025

Reducing the Tool Cost

The cost of the standard universal tooling equipment was the same as that of the special tooling originally planned, but a careful comparison of the individual tools in the original and in the revised layouts will show that the revised, standard tooling has many valuable features not necessarily required for this particular job.

The standard tools also have a cutting range greater than demanded, in fact, equal to the cutting range of the machine itself. Since the production of this universal tooling equipment by the manufacturer of the machine is on a quantity basis, the complete tooling in the revised layout was bought from the maker for about the same cost as making up the original special tooling. At the end of the run the universal equipment was available for handling a great variety of other chucking work, over a long period of time. This naturally greatly reduced the tooling cost of all jobs handled on this turret lathe in the future.

The Answer for the Quantity Producer

We may now answer in summary form the final question of the quantity producer.

I. Production. In quantity work universal types of tools usually equal special equipment in output, and when overhead piloting or other features afford an advantage, standard tools excel.

II. Cost. The initial cost of standard universal types of equipment is usually about the same as that of homemade, special equipment, but through quantity production methods of making standard tools a more universal tool is thus obtained without extra cost.

Hence, the use of standard, instead of special tools, wherever possible, greatly reduces the total tooling cost on a long time basis.

The Second Annual Midwest Power Show

POWER plant executives, managers, and engineers, men who manufacture and distribute and apply power machinery, men who design and build plants, and all other engineers who play a part in this great industry, will be presented with an unusual opportunity to see a cross-section of the latest achievements in their field of endeavor when the Second Annual Midwestern Engineering and Power Exposition opens its doors in Chicago February 15.

The Midwestern Exposition and Power Conference will be held in the Coliseum, which has been taken over in its entirety to provide ample space for the increased number and variety of exhibits, and to permit uninterrupted meetings at which leading minds of the industry will deliver important addresses.

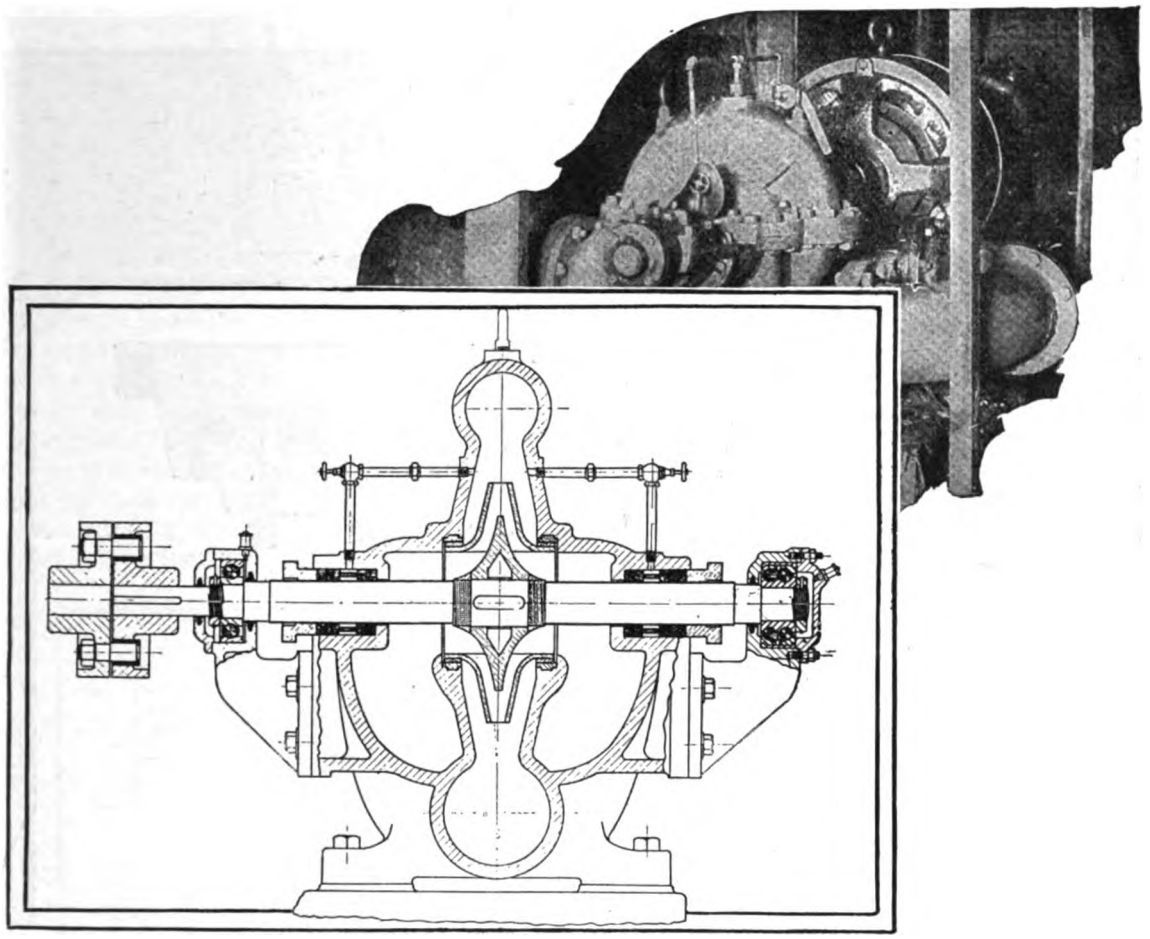
A notable adjunct to the power show will be the second annual Midwestern Power Conference. Organized only a year ago it now has taken rank as the largest, most significant and greatest [illegible] of interest of any conference ever held in the [illegible]al field of power.

Present plans call for five sessions and a series of sightseeing trips to important plants in the Chicago territory, so that virtually every moment from the opening on February 15 to the closing on the evening of February 19, will be filled with interesting and profitable activities.

The number and diversity of the exhibits will constitute an index to the scope and influence of the power industry. In fact, the exhibition will be an epitome of power in every meaning of the word.

Here will be seen the engines, boilers, turbines, motors, and the numerous electrical devices which have found their way into the very fabric of life. Everything of interest to the engineer, from the latest method of coal burning, the newest method of water softening and cleansing to the most economical means of transporting material and the latest development in handling the high steam pressure as exemplified in the great utility plants, will be available for study. In a word, it will be the story of power, its processes, and operations, its great progress and development brought up to date.

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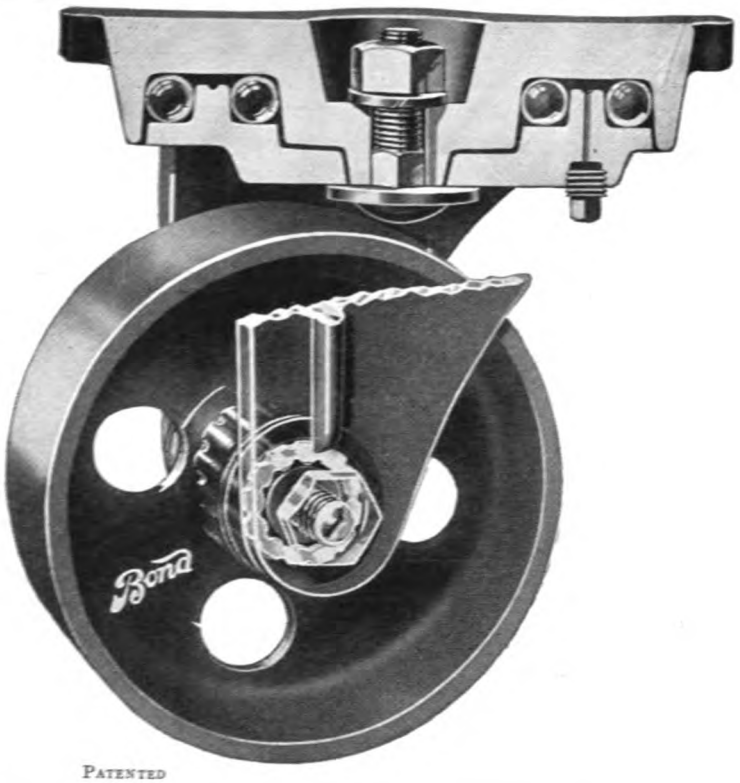
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A Practical Budget Control System

By Samuel J. Hopper

BUDGET control is becoming the watchword in all industries, many excellent books have been written on the subject, and most executives are introducing a system into their plant. By budget control, indiscriminate expenditure is prevented, and all expenditure is under more direct supervision.

The following gives a practical system that has been introduced by the writer into various plants, and found to be very simple, concise and effective.

The first obvious step is to decide the allotment against each work order, and for each department. This is decided after consultation with the department heads, and after considering actuals for the previous year, or if the budget control is a new innovation, it is advisable to take an average of the expenditures over a period of years.

The budget allotment sheet shown in the illustration gives the desired information, the columns headed Working Order Number and Actuals are primarily compiled by the budget control department, comptroller, or if either do not exist, the cost accountant. The departmental head, who should be familiar with the proposed output, maintenance, and additions for the year under review, is required to compile what he considers should be his departmental allotment, supplemented with remarks as to why there is an increase or decrease in his suggested allotment. These figures are submitted to the superintendent, works manager or other authority who gives the final decision and sanctions the allotment if it meets with approval.

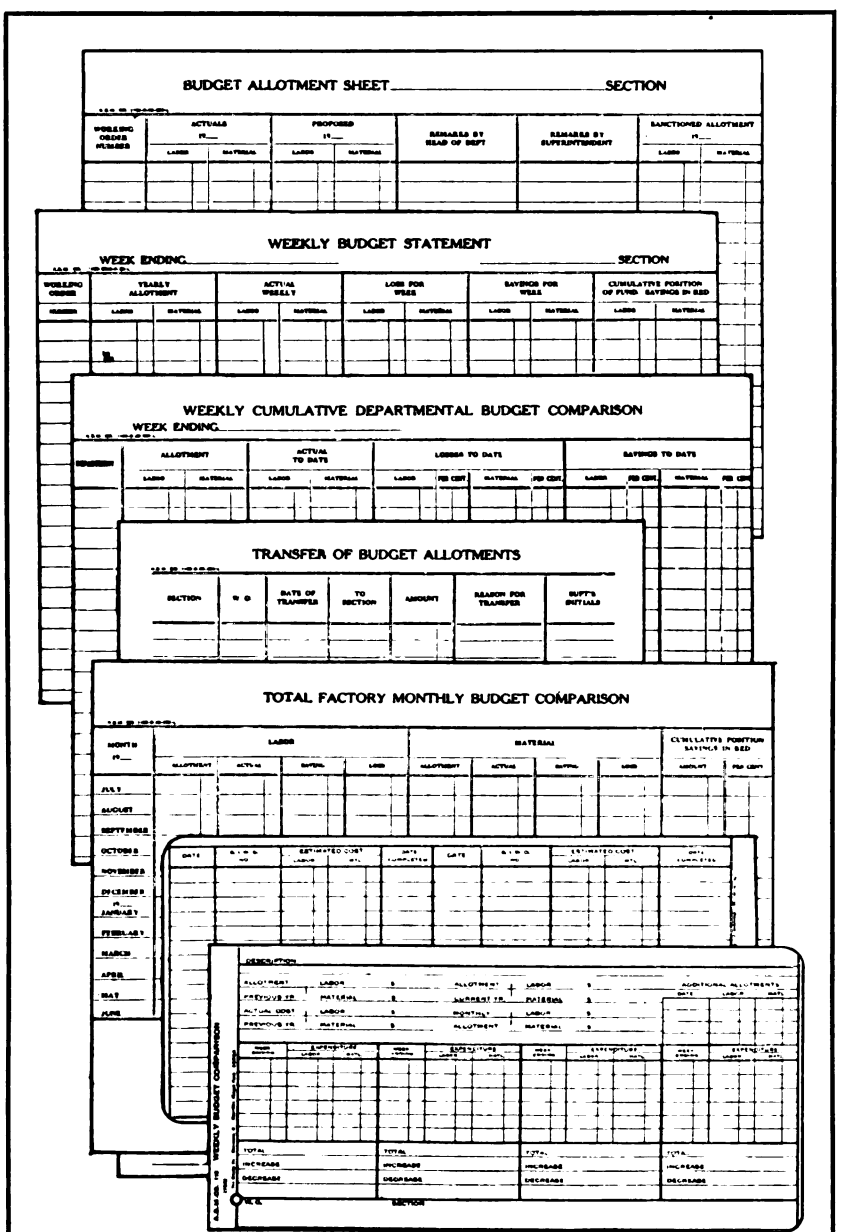
The weekly budget comparison, gives the description of the Working Order Number, previous years' allotments, in labor and material, the current year's similarly, and any additional allotments made, which is necessary to cover either under-estimated figures or unforeseen circumstances. The actual weekly is posted under labor and material, and the total monthly is compare with the allotment. On the reverse of this form is posted the estimated cost in labor and material against each work order, supplementary to the main working order number given on the obverse side.

The idea being, for the department responsible for issuing the supplementary orders, to scrutinize the progressive estimated value of these, and if the progressive figures should become too near, or tend to exceed the allotment take necessary action with the department concerned and probably get permission to issue further orders, and get an additional allotment if this is desirable.

The weekly budget statement is compiled for each section, or department, and gives the comparison between the allotment against each working order, the weekly loss or savings, and the cumulative position of the fund.

The weekly cumulative departmental budget comparison gives the comparison between the allotment, the actual, and the loss or savings, in actual figures, which are progressive and the loss or savings in per cent.

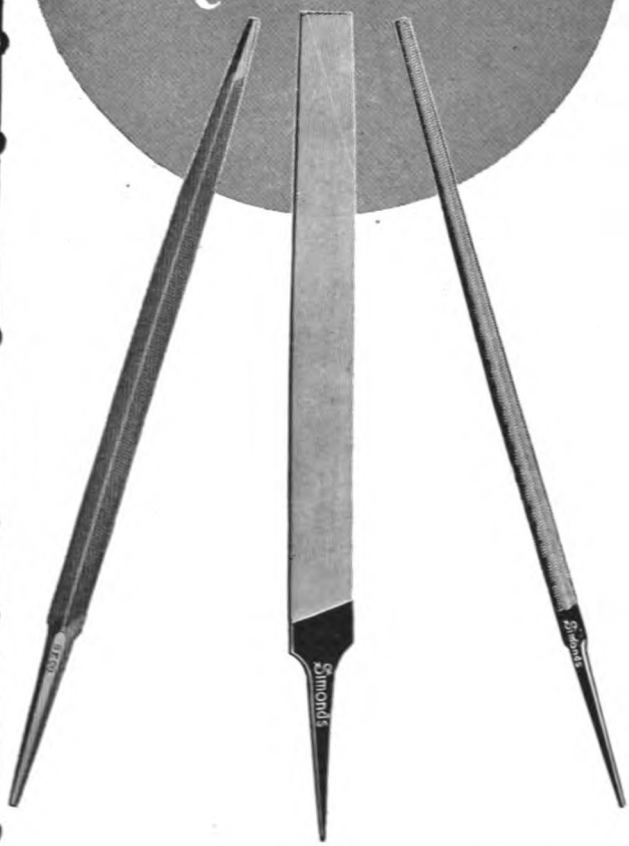
The total factory



Forms for use with a practical budget control system successfully introduced into several plants.

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monthly budget comparison gives the monthly comparison for the whole of the factory, between the allotment and actuals, also the cumulative position, from which can be seen at a glance whether those comparisons are favorable or otherwise.

The transfer of budget allotments is undoubtedly desirable and necessary at times to make a transfer of budget allotments, as it is almost impossible to budget so accurate that the actuals will not vary with the allotment.

This form is designed to take care of those transfers, stating why it was necessary to do so.

The National Exposition of Power and Mechanical Engineering

THE Fifth National Exposition of Power and Mechanical Engineering, held in Grand Central Palace, New York, the week of December 6, 1926, was a tremendous success. It registered strides of progress throughout the entire field of the design of all types of mechanical equipment. In diversity of exhibit and in quality of equipment shown, the show was a great improvement over the four previous events.

During the week of December 6 through 11 the Grand Central Palace was open daily from noon until 10:30 p. m. One hundred thousand visitors poured through the doors to study the novelties displayed by four hundred and ninety manufacturing firms on four floors of the building.

An exposition of this character exerts a tremendous educational influence and the management encouraged it by securing from those who were interested in problems of mechanical design some novelties for the interest of the visitors. The exhibits were amplified by means of an interesting program of moving pictures of mechanical devices that could not readily be reproduced in action in the show itself.

In the field of power generation the exposition drew many novelties in the design of boilers, in the development of refractories, in the adaption of valves and fittings for high pressure operation, in the provision of several new methods of control for boiler plant operation, and in the development of new measuring devices.

In the boiler field there were several exhibitions of watercooled walls and a few displays of the design of complete steam-generating units. One manufacturer presented a complete design of a steam generator using small tubes. Other boiler manufacturers revealed new methods for the manufacture of boiler parts to withstand high pressures and temperatures.

Manufacturers of refractories displayed new designs and new materials with which they are contesting the trend toward metal casings for combustion chambers. Special shapes of refractories for air-cooling and water-cooling, and special provisions for quick replacement and repair of refractories were shown.

A large number of electrically, hydraulically and pneumatically operated valves were shown by the manufacturers of valves and fittings, for operations up to 650 lb. pressure and 750 deg. Fahr. The novelty in this

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THE VORTEX MANUFACTURING CO.
1977 West 77th Street Cleveland, Ohio

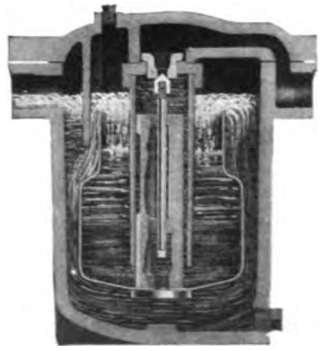


THE VORTEX MANUFACTURING CO., Cleveland, O.
Without obligation, please furnish me data as to painting costs on the following·

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Name of Company.....
Address.....
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Individual.....
No. of Yards.....
Inside.....Outside.....Color.....
V-24



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ILLINOIS Eclipse Steam Trap

Shipped Prepaid on 60 Day FREE Trial

Engineers, if *you* have a "worst service" *that's* the place to put an *Eclipse* Trap for a test!

Under ordinary conditions most any trap will operate reasonably well for a while, but—it is the severe condition—the *worst service*—that shows how an Eclipse will end your trap troubles.

The Eclipse is not "just another steam trap." Its valve action makes it the OUTSTANDING Steam Trap of the Day!

No Other Trap Has This Feature

The valve action is SNAP action. It is either tight closed or wide open. Never cracked on seat. Wire drawing impossible.

Other Features: Can't blow steam or air-bind. No complicated levers—only TWO moving parts.

This coupon brings prepaid an Eclipse Improved Steam Trap for 60 day free trial.

MAIL IT TODAY

ILLINOIS ENGINEERING COMPANY
21ST AND RACINE AVE., CHICAGO

Please ship prepaid an ILLINOIS Eclipse Trap for 60 day free trial. It is understood that this is to be of *no* expense to me and that after testing the trap I may return it WITHOUT QUESTION.

Size of pipe connections .....Trap capacity.....

Maximum steam pressure .....

Firm .....

Address .....

.....

Signed .....Position .....

☐Send trap bulletin only.

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPORATED 1900
CHICAGO

field was a swing-gate valve which occupies much less space than the present form. Improved valve seating arrangements, stainless steel trimmings and monel metal trimmings were featured by a large number of exhibitors. Special types of gaskets, pipe joints, and methods of welding were given a large amount of space throughout the show.

Pulverized fuel is holding its place in the attention of power engineers and the progress in the art of using it economically was revealed by the large number of turbulent burners and unit pulverizers shown.

The possibilities of using superheated steam were brought out by many manufacturers who showed how the superheater elements could be combined in many different ways with existing boiler designs. A novelty in this series of exhibits was the showing of two superheater elements which had been in service for a number of years.

In the field of control there were several interesting exhibits. One adopted an electrical method of varying the fuel and air supply in proportion to a direct current which was, in turn, varied by the steam pressure. A sensitive excess feed water pressure regulator was shown, as was a new universal type of control suitable for adoption to regulate temperature, pressure draft, water flow, air flow, etc.

The part that measuring devices play in power plant operation was impressed upon the visitor by over thirty exhibits of devices for measuring and recording the operating factors in all types of plants. The improvements in operating economies of industrial plants are largely due to the splendid instruments that are now available to the operating engineers. The list of exhibits showed many improvements and refinements in the many types of equipment displayed.

The tremendous influence that welding is having on all types of mechanical equipment was shown by a large number of exhibits of various types of welding equipment and a very large number of products manufactured by the welding process.

Other equipment of interest to power plant operators was a complete service of diagrams of condensers, air motors, air filters, pumps to operate against high pressures and stokers. In addition there were electric gas analyzers, electrically-operated safety valves, and two types of ventilated motors for operating in a dust-laden atmosphere.

The exposition brought out a large amount of apparatus required by the heating and ventilating engineer. There were several new types of furnaces and boilers designed for high tip speeds and there was a complete model of the apparatus used in cooling the air for a theatre.

In the field of power transmission there was an impressive array of exhibits of ball bearing manufacturers, of reduction gears and all types of bearings and belting. Other classes of exhibits which should be mentioned are machine tools, shop equipment, coal handling and ash handling devices, conveying machinery, illuminating equipment for factories and power houses, and packings.

The plans are already under way for the holding of the Sixth Power Show from December 5 through 10, 1927. The Advisory Committee which assisted the management in the conduct of the show consists of I. E. Moultrop, chairman; W. L. Abbott, Homer Addams,

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OSBORN



1779—Wire Scratch Brush. Made with curved back. For removing paint, varnish and rust.

Osborn Wire Brushes Scientifically Treated

Osborn Wire Scratch Brushes are scientifically treated to assure a permanent cutting quality. As is true of all Osborn better-wearing brushes, they are built *specifically* for the job.

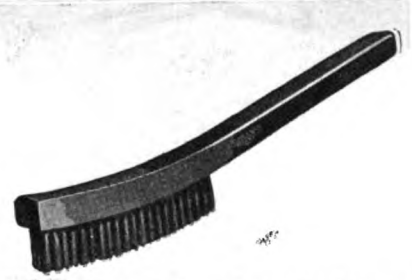
In addition to the special treatment of the wire, they are also skilfully shaped to make working easier and quicker.

For removing paint and varnish, cleaning wood, stone, brick, metal, iron-work, foundry castings and rubber, select wire scratch brushes bearing the Osborn trademark for the utmost in efficiency and economy.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED

5401 Hamilton Ave. **Cleveland, Ohio**

Osborn Brushes



1777—Steel Wire Scratch Brush. A narrow brush for pattern makers' and braziers' finishing work, cleaning architectural iron work, figured brass and small castings. Size $\frac{13}{16}$" wide, length over all 14", length of wire $1\frac{11}{16}$".



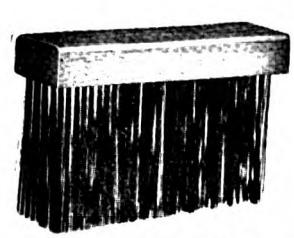
28—Bridled Casting Brush. This brush contains more wire than the ordinary casting brush. Heavy sheet iron bridles minimize vibration and reduce breakage of end wires. Will give 2 to 3 times the length of service.



1781—Wire Scratch Brush. Standard Shoe Handle Brush for household, auto or factory use.



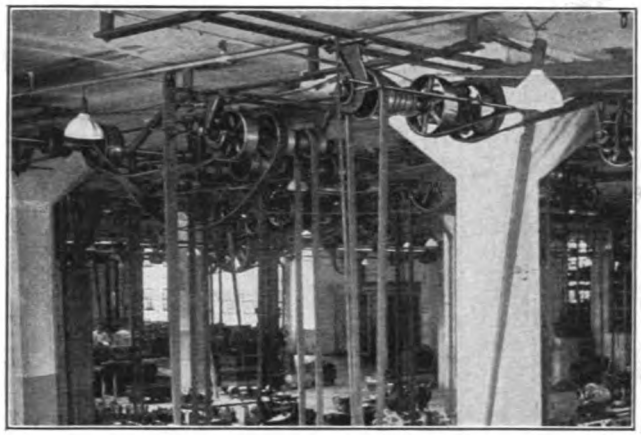
1780—Wire Scratch Brush. Straight back brush with extra long wires for general use. The wire used in Osborn Scratch Brushes is the first quality tempered steel, drawn especially for scratch brush use.



7—Plain Wire Casting Brush. Made of Special Tempered flat steel wire—Very strong and durable. Made in several sizes.

A BETTER WEARING BRUSH FOR EVERY USE

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"Everything
In Line Shafting Equipment"

From Turned Steel Shafting—including every related power appliance—up to Pulleys 16 ft. in diameter—Medart is always ready with quick service on "Everything in Line Shafting Equipment."

Established in 1879, Medart made the first steel rim pulley ever built. Since that time the company's activities have expanded to a point where today the plant occupies more than one-quarter million square feet of floor space—devoted to the manufacture of every type of equipment used in the mechanical transmission of power.

Coupled with the ability to furnish "Everything in Line Shafting Equipment," Medart sets the pace with "right now" service. Next time, try this Medart combination on your emergency orders or initial purchases.

Catalog 43

Catalog No. 43 is a concentrated buying guide that simplifies transmission machinery purchases. Send for your copy today, together with discount sheets.

THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
Office and Warehouse in Cincinnati
Manufacturers of Power Transmitting and Kindred Machinery

MEDART
Everything in Line Shafting Equipment

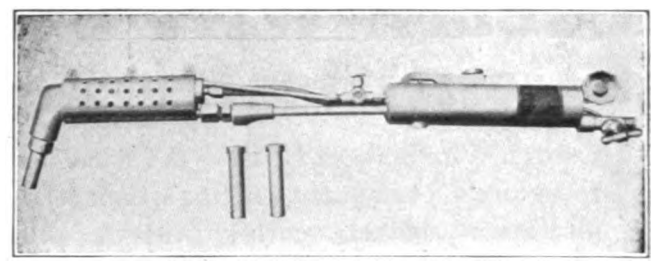
N. A. Carle, W. H. Driscoll, Fred Felderman, C. F. Hirshfeld, O. P. Hood, L. H. Jenks, E. B. Katte, R. T. Kent, John H. Lawrence, Fred R. Low, David Moffatt Myers, R. F. Pack, Fred W. Payne, H. B. Reynolds, Calvin W. Rice and Charles F. Roth.

A Cutting Torch Using Illuminating Gas

THE Alexander Milburn Company, Baltimore, Md., manufacturers of welding and cutting equipment, has just placed on the market a gas cutting torch for use with illuminating and by-product gases.

This torch is the result of extensive experiment and research in the utilization of a cheaper fuel, thereby reducing cutting costs materially. With city gas costing but 1/30th that of other gases, it can readily be seen that there is a great saving in fuel gas alone.

An outstanding feature of the Milburn torch is the super-heater which heats and expands the cutting oxygen, also the preheating gases, raising the temperature



This cutting torch burns illuminating gas.

of the cutting oxygen to approximately 100 degrees Centigrade prior to combustion. This increases the temperature of the gases at the torch tip, increases the rate of flame propagation in the burning mixture and reduces the oxygen consumption from 25 per cent. upwards.

A Bunsen burner contained within the torch, burns, illuminating gas, which heats the cutting oxygen as it passes through a series of copper coils.

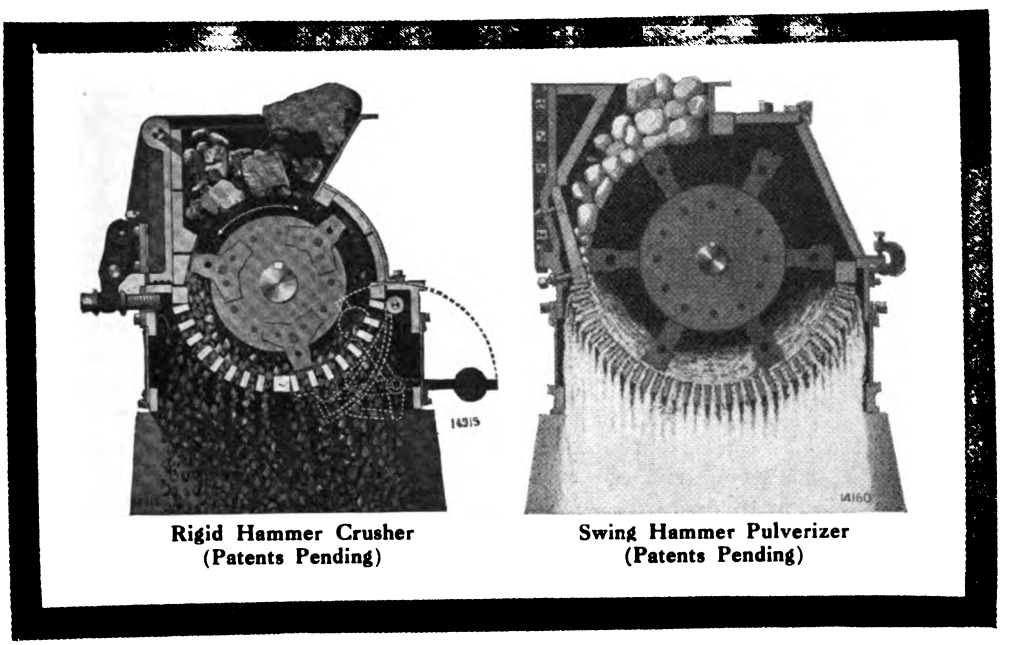
The heated and expanded oxygen in conjunction with the illuminating gas gives better penetration into the metal, a narrow kerf and sharp, clean edges, speedy and smooth cutting with a notable absence of metallic slag on the underside of the cut. It does not case-harden the surfaces cut, in fact, it leaves them in practically the same state as the original steel.

Heavy plate and slabs, risers of steel castings, structural shapes, gates, billets and general steel foundry work are cut with this torch. The torch operates on city gas or natural gas, which, due to its availability and low cost, minimizes the cost of operation and also affords a high degree of safety.

The torch is ruggedly constructed of bronze forgings and specially drawn tubing. The high pressure cutting oxygen is controlled by a thumb valve which remains fixed in either open or closed position. The arrangement of the gas tubes gives the torch great transverse strength. It is substantially built, well balanced and easy to handle. The torch is 21 inches in length and is supplied with a complete range of tips for light, medium and heavy cutting.

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Here's the "Proof of the Pudding"



Rigid Hammer Crusher (Patents Pending)

Swing Hammer Pulverizer (Patents Pending)

Complete data on these and other types of Jeffrey Crushers, Pulverizers, and Shredders will be sent on request.

A few users of Jeffrey Pulverizers, Crushers and Shredders

Wm. Zinsser & Company
Mantrose Corporation
Acheson Graphite Company
Armstrong Cork Company
Crown Cork & Seal Company
Franklin Limestone Company
Celotex Company
Philip Carey Mfg. Company
National Gypsum Company
United States Gypsum Company
Swift & Company
Wilson & Company
Central Leather Company
Marion Extract Company
American Dyewood Company
J. S. Young & Company
American Bottle Company
C. C. Smoot Extract Company
Electric Smelting & Aluminum Company
North Hudson Chemical Company
Hershey Chocolate Company
Hercules Powder Company
Beaver Products Company
American Sugar Refining Company
Pennsylvania Sugar Company
Central Paper Company
Scranton Button Company
Columbus Packing Company

"THE proof of the pudding is in the eating"—an old saying but how true it is.

Glance over the list of plants at the left—each represents a satisfied user of one or more Jeffrey Crushers, Pulverizers or Shredders.

The materials passing the teeth and hammers of these machines are as varied as the users' names—gypsum, limestone, coal, bones, alum, rock salt, shale, slate, clay, marl, tankage, wood chips, bark, etc.

A task requiring *severe service* can be forgotten when you put a Jeffrey machine on the job.

The Jeffrey Manufacturing Company

946-99 North Fourth St., Columbus, Ohio

New York	Pittsburgh	Cleveland	Milwaukee	Los Angeles
Buffalo	Scranton, Pa.	Charleston, W. Va.	St. Louis	Birmingham
Rochester, N. Y.	Boston	Chicago	Denver	Charlotte, N. C.
Philadelphia	Cincinnati	Detroit	Salt Lake City	Montreal

JEFFREY
MATERIAL HANDLING EQUIPMENT

JEFFREY PRODUCTS
Elevators—Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling. Washing and Screening Equipment
Locomotives
Coal Mine Equipment
Tipple Equipment
Ventilation Fans

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LAY
METAL CASE BROOMS



First made in 1876—
First choice in 1927!
Every user is a booster

WRITE FOR ILLUSTRATED PRICE LIST

For more than half a century Lay Metal Case Brooms have been the outstanding choice of industrial institutions that know how well it pays to buy supplies with care. Today, Lay Brooms are used in more than 4,000 great establishments. There is a reason for the favor they enjoy—a reason which you, too, will discover when you start to use them in your plant!

THE JOSEPH LAY COMPANY
Portland, Indiana

Branches:

Milwaukee	New York City	Cleveland	Chicago
400 University Bldg.	110 W. 34th St.	9343 Gorman Ave.	920 Medinah Bldg.

Move to the Right

By Elton Sterrett

WHEN the Bayport flour mill was completed it was conceded to be among the most modern of its kind, with every mechanical appliance known to the industry for reducing manual labor and eliminating the human factor. Yet it had not been operating more than six months before the pay office began to question the overtime slips that kept coming in from the bagging department.

Here the finished product was collected in three bins, feeding into the hoppers of automatic weighing machines. Directly behind the weighing stands circled a continuous platform conveyor, just low enough so that the filled sacks slid gently from the weighers to rest against the conveyor at a slight angle from the vertical. From these three machines the sacks passed beneath the head of the stitching machines, where they were sewed with the customary loop-stitch. A little farther around the circuit stood the inspector, judging the thoroughness of the bag's closure, and with a twist of his wrist sending the perfect sacks tumbling down chutes to the shipping department below. Imperfectly sewn sacks were allowed to remain on the conveyor, remake the circuit, and again pass through the hands of the sewing machine operator.

The first operator of the stitcher had been an old negro, of the type called "Uncle" throughout the South, and it was only after the old man had been incapacitated by illness that the department began to send through slips for from one to three hours of overtime, for the six-man gang, every other day or so in its effort to keep abreast of the remainder of the plant.

A check-up of the various operations in the department localized the delay at the stitching machine. It was seemingly impossible for the operator to close the sacks as fast as the three hoppers filled them. Old "Uncle Mose" had never seemed to work fast at the machine, yet he had kept abreast of the weighers without apparent effort. In an attempt to discover the secret of this the superintendent drove out to where the old man lived, finding him in bed and penniless.

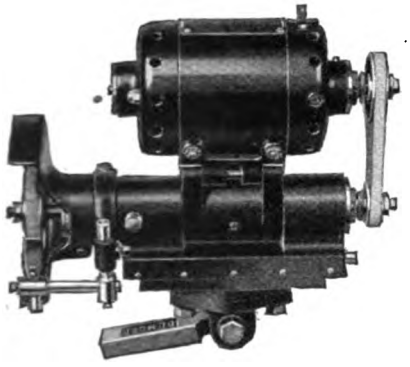
The efficiency visit quickly became a humanitarian one, with the old man insisting on regarding the funds supplied as a loan, and giving a painfully scrawled receipt for the money—propping a board on the bed and tracing his name with his left hand across the form the official had drawn up at his request.

Back in the plant again, the superintendent went into the bagging room to watch the work. As each sack, coming from the stitcher's right, came within reach he would gather up an ear in his fingers, start it through beneath the needle, and pull it on with the left hand, holding up the trailing corner in his right hand until the seam was nearly completed.

It was not until his memory flashed back to the old man scrawling his name with the left hand that a solution of the difficulty appeared—Uncle Mose was left-handed, and he had just happened to fall into a left-handed job.

To prove the theory, the stitching machine and its controls were removed from within the curve of the conveyor so that the operator sat on the outside. Despite the fact that he had to pull the sacks slightly toward him

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Dumore, No. 3 Multi-Speed Grinder. Furnished complete with tool and wheel equipment.



To Exact Dimensions

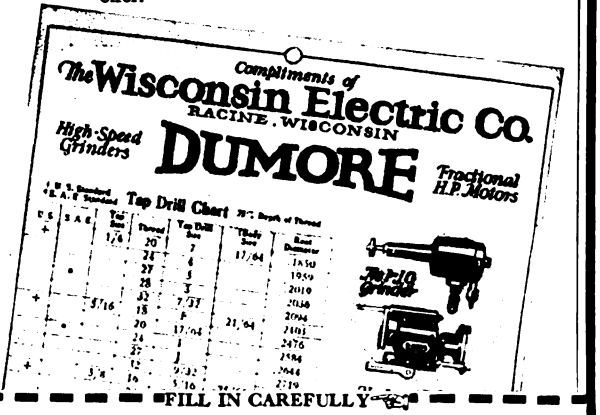
LET a workman use reasonable care up to the finishing point and a Dumore Grinder will unfailingly finish any surface, internal or external, to exact dimensions. Perfect balance and correct grinding speed insure performance so perfect that every job can be finished within the tolerance limits.

Oftentimes a Dumore Grinder can be used on expensive setups where accuracy demands that two or more operations be performed without changing the setup. The possibility of spoilage is avoided and many times a big saving in time and money effected. Let us explain why Dumore Grinders insure exact dimensions. Use the coupon.

Dumore Grinder Advantages

There are six Dumore Grinders with individual speed ranges from 3,600 to 50,000 R. P. M. Correct speed without vibration, eliminates taper, bellmouth and chattermarks, common with less efficient tools.

Use the coupon below, it will bring one of our Tap Drill Charts and complete details of our new exchange offer.



DUMORE

Electric Toolpost Grinders

The Coupon

It will bring a Free Tap Drill Chart and complete details of our trade-in plan.

FILL IN CAREFULLY

Wisconsin Electric Company
70-16th St., Racine, Wis.

Please send me Free, a Tap Drill Chart and tell me what allowance you will make on the Grinder I have now. This grinder is—

.....

(Insert make and model of Grinder you have on this line)

Name .....

Address .....

City ..... State.....

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Waste Matter

-- starts fires
-- causes delays
-- hoards disease

Get rid of it-- the GODER Way!

Dispose of factory waste, sweepings, etc., quickly, completely, economically and sanitarily with a GODER Incinerator that has been designed to fit your individual requirements.

GODER High Temperature Waste and Refuse Furnaces will solve your waste disposal problem perfectly. Made in all sizes and types to fit any kind of conditions. Can be installed in either OLD or NEW buildings.

Preliminary consultation and engineering service furnished without cost.

Write for descriptive literature.
Sent free to interested executives.

GODER INCINERATOR CORP.

317 No. Michigan Ave., CHICAGO, U. S. A.



90% of all the Shops

use

ARMSTRONG Tool Holders

For over 33 years, ARMSTRONG Tool Holders have been universally used by the better class shops. Production is increased because dull tools can be replaced quickly, as well as more readily set up. No matter what kind of work is required, one of the many different shapes and sizes for the lathe, planer, shaper and slotter will fit the job.

ARMSTRONG Tool Holders SAVE: *All Forging* / *70% Grinding* / *90% H. S. Steel*

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

318 N. Francisco Avenue CHICAGO, U. S. A.

For products not ad[illegible]

for the sewing, it was found that with the right hand free to lead the seam along under the needle the percentage of rejects dropped to only a fraction of those formerly resewed, and the conveyor, carrying sacks around only once, was ample to keep the three filling hoppers clear—as was the stitcher adequate for the task of sewing when it was called upon to perform its task but a single time on each bag filled.

A slight shift in the facing of one machine thus speeded up the equipment amply for the plant needs, obviating the expenditure of funds and space for a second conveyor and stitcher, forecast as the only solution of the difficulty until chance called attention to the fact that the delay was at a left-handed job—one which not one man in ten can fill as well as one which is adapted to the righthandedness of most workers.

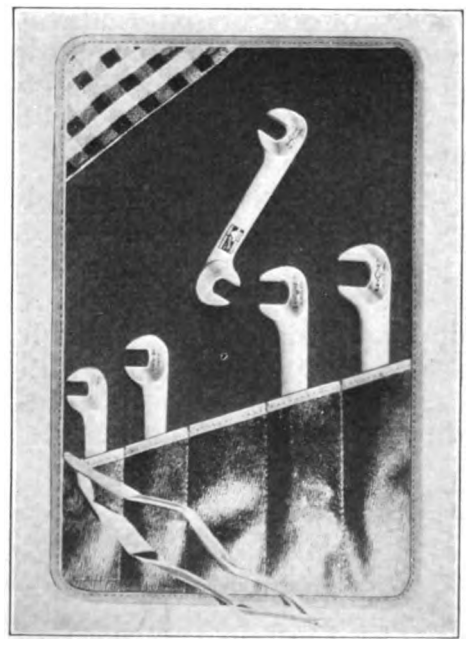
"Move to the right" is as applicable to factory routing as to highway traffic, and a violation of this principle likely to prove equally as costly.

New Right-Angle Wrench

BONNEY FORGE & TOOL WORKS, Allentown, Pa., makers of chrome vanadium wrenches, announce a new style of Bonney chrome vanadium right-angle wrenches.

These wrenches have a 90-degree angle of opening, and are designed for work in close quarters, where it is impossible to use a 15-degree or 22½-degree opening.

Because of the tremendous strength of chrome vana-



Bonney chrome vanadium wright-angle wrench set.

dium steel, the heads of these wrenches are "pear-" making the ends of the jaws very sharp, to get into close corners.

[illegible]es are shaped to give the operator a com-[illegible] and are finished in nickel with polished [illegible] are made in all standard combinations of [illegible]om 5/16 to 7/8 inches.

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A Shining Record of Quick Prints—at Low Cost

Only the Pease Peerless can produce perfect prints in just a few moments at a saving in cost, in many instances as high as 50c. on every $1.00.

If you can keep a Pease Peerless busy just a few hours each day, you can cut your costs considerably and the equipment will pay for itself in time and money saved through making your own blue prints.

With the Pease Peerless you can turn out up to 120 linear yards per hour of perfect blue prints—printed—washed—potashed—and dried—in one continuous operation and yet as short a run as five to ten yards can be made to distinct advantage. Merely feed the tracings, the Peerless does the rest—gives you perfect prints ready to use immediately.

No waiting on outside assistance. You know exactly when to expect prints and how much they will cost because every operation is under your own control.

Let us help you solve your blue print problems—increase your production and cut your costs.

Ask for a copy of Catalog M-28

THE C. F. PEASE COMPANY

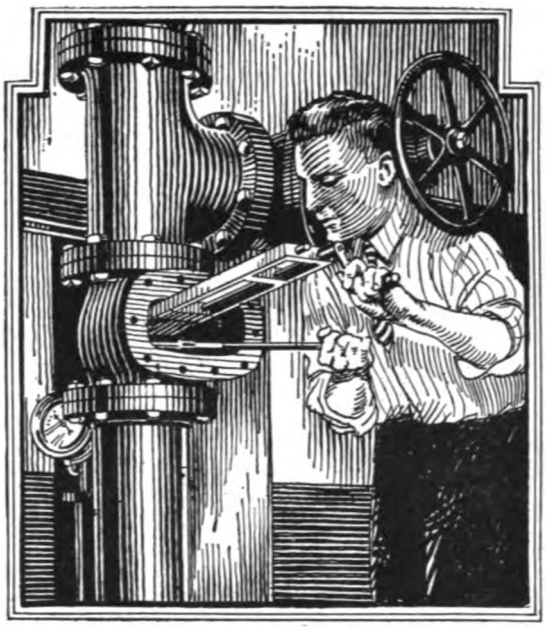
828 N. Franklin Street **Chicago, Illinois**

PEASE

BLUE PRINTING MACHINERY

"Let Blue Prints Tell Your Story"

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Dexter Gate Valve
Reseating Machine in Use

Do You Want to Save

Steam

The Dexter Valve Reseating Machine makes and keeps valves steam or fluid tight. In the average plant it prevents a waste of hundreds of dollars annually.

Valves

The Dexter Outfit keeps valves as good as new for many times their ordinary life. Valve replacement and repair expense is reduced 90% or more.

Labor

The Dexter Outfit is exceedingly easy to operate. Any valve can be made leak-tight in a few moments without the trouble and expense of removing the valve body from the pipe line.

If you want to save steam, valves and labor you need to be equipped with a Dexter Valve Reseating Outfit.

Let us send you Catalog 23 containing complete information and prices.

THE LEAVITT MACHINE CO.

27 East River Street, Orange, Mass., U. S. A.

Canadian Agency: Darling Bros., Ltd., 120 Prince St., Montreal

British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne

349

Valve Reseating Dexter Machines

A Guard for Power Shears

MANY unsuccessful attempts have been made to devise a means of protecting the operators of power shears, but it was not until recently that the guard-makers in the Baltimore plant of the General Electric Company found that hand shear guards attached to the power machines were effective. This guard does not interfere with the easy feeding of stock and entirely eliminates the danger of accidents to the operator.

Each clamp is furnished with an automatic floating

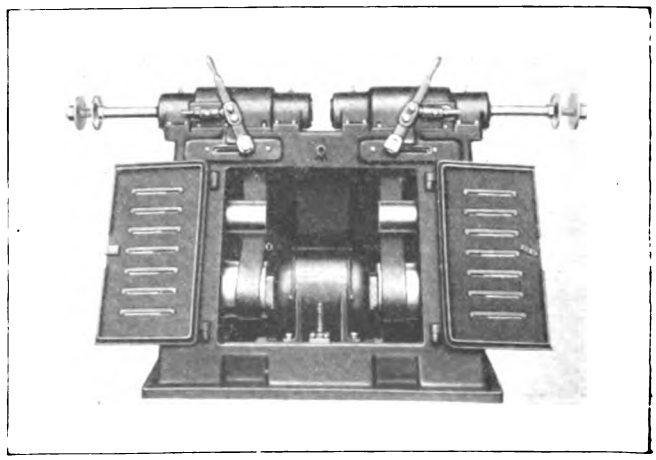


guard which rests on the machine table and prevents the fingers from being placed under it. A piece of 3/16-inch stock is dropped between the clamp and blade to guard the knife. This guard is three-fourths inches from the edge of the knife. The perforations are just large enough to allow a man to see that the stock is in the proper position for cutting. The guard is fastened to the posts of the machine by means of a strap of metal which is welded at each end.

A New Selective Speed Buffer

THE accompanying illustration shows the new selective speed buffer recently announced by The Hisey-Wolf Machine Co., of Cincinnati, Ohio. It is equipped with two independent spindles, as shown.

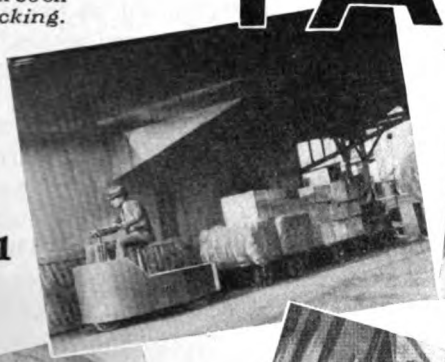
By means of belt shifters in the rear of each spindle it is possible to stop either spindle independently of the other. Working in unison with the shifter, an adjust-



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YALE—the Key to lower handling costs. Chapter 38 on *Storage Battery Trucking.*

TRADE **YALE** MARK



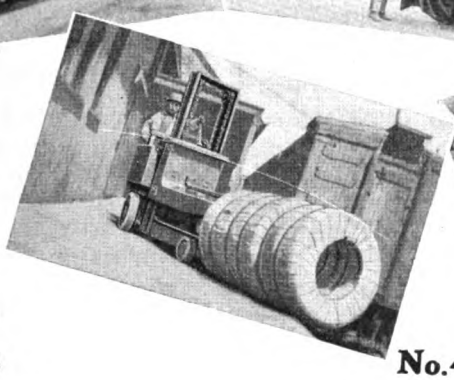
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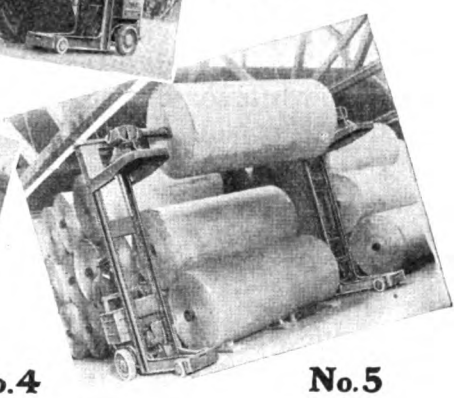
No. 2



No. 3



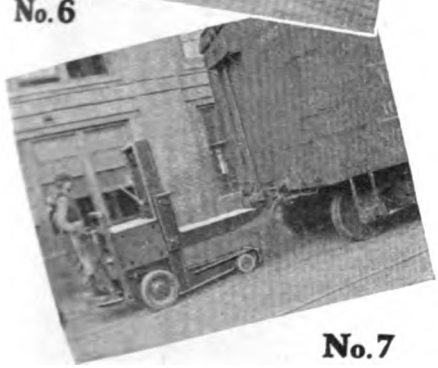
No. 4



No. 5



No. 6



No. 7

Yale Trucks Prove Indispensable!

The Yale K Series Electric Industrial Trucks, with or without special attachments, prove indispensable from the moment they are put in service. Many unusual handling jobs readily lend themselves to a specially devised Yale trucking system—and at lower costs than possible by any other method. Write our engineers. Their experience is at your service.

(1) Yale Model K24B Tractor-Trailer Train handling miscellaneous cargo in stevedoring service.

(2) The Yale K22 Elevating Platform Truck being used in California as a shooting platform for the director and photographer.

(3) Yale Model K24A Tractor in express service.

(4) Coils or reels of wire are easily handled by a Yale Model K22 Elevating Platform Truck with Boom attachment.

(5) Stacking 8,000-pound rolls of paper with Yale K22 Elevating Platform Trucks having an overall height of 146 inches.

(6) Yale Model K22 handling bulk clay in the terra-cotta industry.

(7) Yale K22 Elevating Platform Truck used for spotting freight cars in and out of machine shop.

Is one of your problems here illustrated? If not, tell us something of your process, as there is a Yale Electric Industrial Truck for every type of service. May we send you the latest Yale Truck Bulletins?

The Yale & Towne Mfg. Co., Stamford, Conn., U. S. A.

YALE MARKED IS YALE MADE

YALE Hoisting and Conveying Systems

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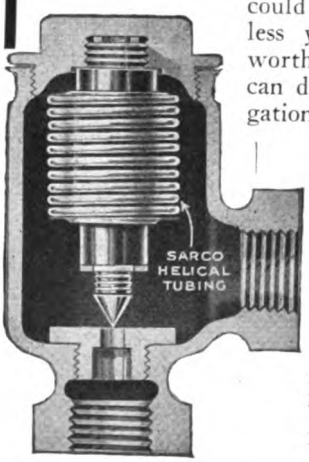
It was costing a large manufacturer an average of $22,500.00 a month for coal. One of our Engineers was called in to make a survey. He found here and there a large steam trap, while some steam lines where condensation collected were without any traps.

On our recommendation, all the inefficient old traps were scrapped and 257 Sarco Steam Traps installed. The result was a coal saving amounting to $7,500.00 a month.

The coal the Sarco Steam Traps saved paid for the traps in seven days.

This is a shining example of the huge savings constantly being made by trapping steam lines with the Sarco. Even in small plants almost unbelievable savings are frequently effected.

How do you know that you could not effect big savings unless you investigate? Isn't it worth looking into, when you can do so without cost or obligation?



Write us to have one of our Engineers call; or simply mail the coupon.

SARCO CO., Inc.
183 Madison Ave.,
New York City

Boston Chicago Detroit
Buffalo Cleveland Philadelphia

Peacock Bros., Ltd., Montreal

SARCO STEAM TRAP

SARCO CO., INC.,
183 Madison Ave., New York.

☐ Please have one of your Engineers examine the trapping conditions in our plant and make recommendations without any cost to us.
☐ Send Booklet No. R-281.

Firm .....
Address .....
City .....

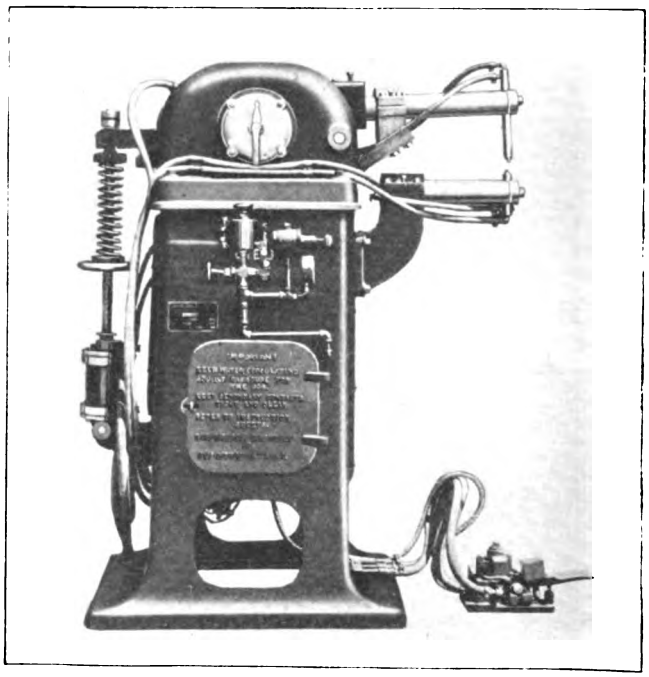
For pr ised in this issue write Industry Illustrated

able brake engages when belt is shifted on loose pulley, thereby holding spindle stationary until belt is again shifted. The belt tension can be easily regulated by the adjusting levers at either end of machine. Further adjustment can be obtained, as the machine is mounted on a hinged platform equipped with screw adjustment. Two large doors in the rear permit full view and access to the entire machine. Ball bearings (12 in all) are used throughout and are provided with liberal means of lubrication. As in other Hisey products, Full Safety Automatic Motor Starter with push button control is standard equipment. If desired, spindles can be provided with a different speed on either end. This machine is made in three sizes with 7½, 10 and 15 hp. motors.

A New Air Operated Spot Welder

ATTEMPTS to increase speed on a hand or foot operated spot welder have frequently resulted in poor welds, owing to the personal equation varying the length of time in the making of a weld. Although heat and pressure remained constant, the time element changed more or less with each weld. In addition, speed on a manually operated spot welder where there is large production has always been accompanied by fatigue.

The air operated spot welder insures uniformity in heat, pressure and time and as a result, uniformity in welds. The operation by air is almost instantaneous. The slightest pressure at the air valve operates the machine. Girls can operate the high speed air operated spot welder without the slightest fatigue. Production has been increased by the use of the high speed air operated spot welders from thirty to ninety per cent.



A new development in pneumatically operated spot welding machines.

The chief value in the high speed air operated spot welder as made by the Gibb Welding Machines Company of Bay City, Michigan, is on sheet metal of 18-gage and heavier as on this work not only is fatigue eliminated but increased speed is possible. On the lighter gages, while the air operation eliminates fatigue, there is no advantage in speed.

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Equipped

TO CUT GEARS—LARGE OR SMALL

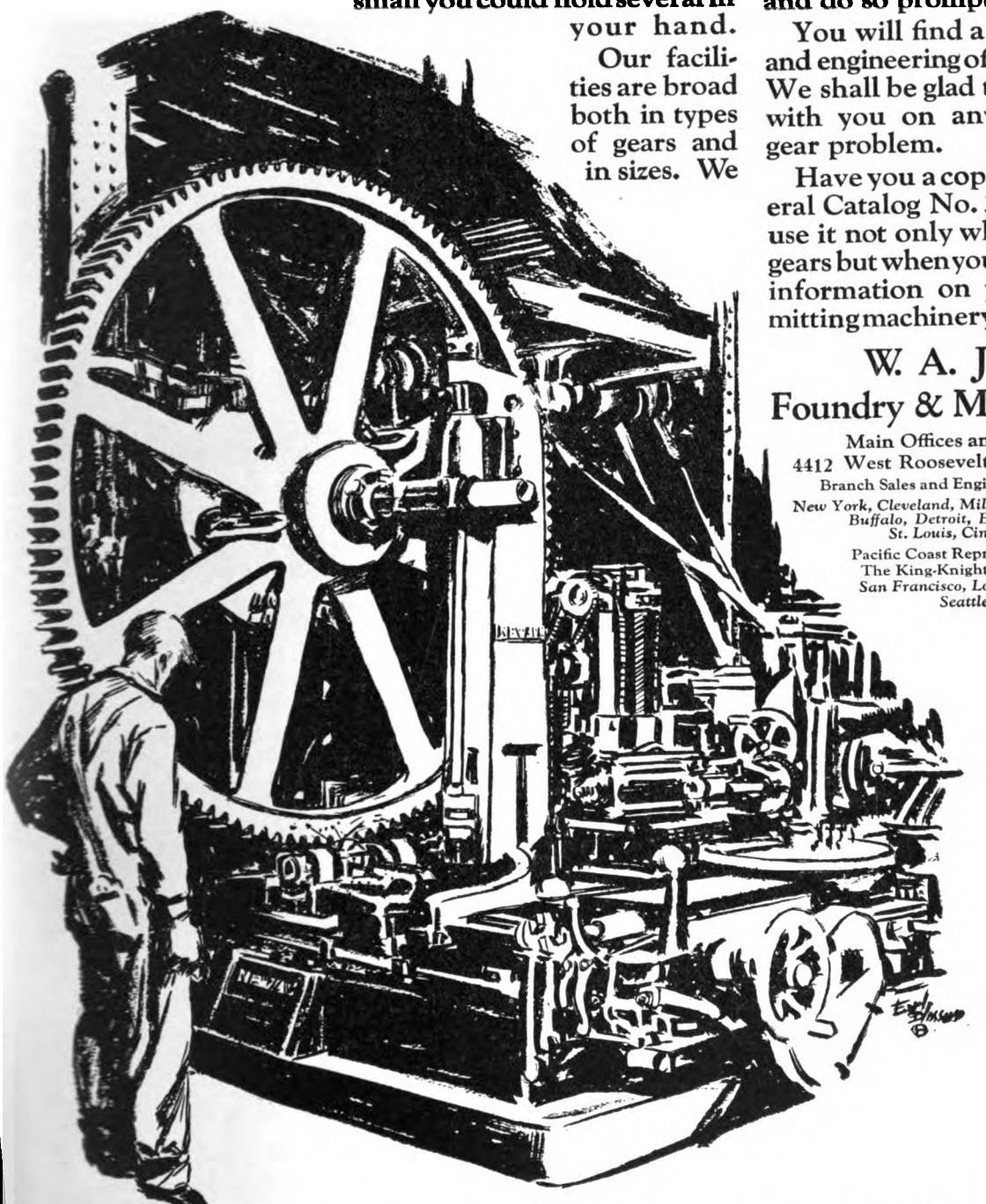
While one of our gear cutting machines is working on a cast steel gear of 96″ diameter and 7″ face, another may be cutting a still larger one, while others may be producing gears so small you could hold several in your hand.

Our facilities are broad both in types of gears and in sizes. We cut bevel, mitre, worm and spiral gears as well as the spur types.

We work in all materials—steel, cast iron, rawhide and bakelite. We can supply your needs, ordinary or unusual, and do so promptly.

You will find a branch sales and engineering office near you. We shall be glad to co-operate with you on any perplexing gear problem.

Have you a copy of our General Catalog No. 30? You can use it not only when ordering gears but when you need special information on power transmitting machinery. Write for it.



W. A. Jones Foundry & Machine Co.

Main Offices and Works:
4412 West Roosevelt Road, Chicago

Branch Sales and Engineering Offices:
New York, Cleveland, Milwaukee, Pittsburgh, Buffalo, Detroit, Birmingham, St. Louis, Cincinnati

Pacific Coast Representatives:
The King-Knight Company
San Francisco, Los Angeles, Seattle

Jones Industrial Gears

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High Quality Tool Equipment Keeps Production Costs Low

Brown & Sharpe Equipment is helping to maintain the lowest manufacturing costs in factories all over the world. Its accuracy, long life, superior design and steadfast reliability recommend it to every manufacturer who needs equipment which will produce the best results.

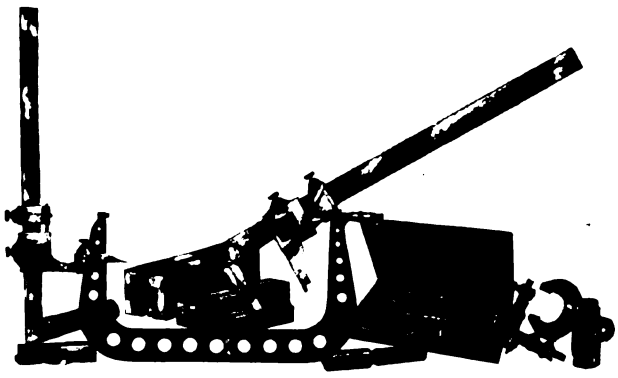
Low production costs result from the use of high quality equipment—that bearing the name "Brown & Sharpe."

The Brown & Sharpe No. 30 Catalog is a buying guide for quality equipment. You should have a copy for reference purposes. If your dealer cannot furnish a copy, write us direct.

Dept. I.

Brown & Sharpe Mfg. Co.

Providence, R. I., U. S. A.



BROWN & SHARPE

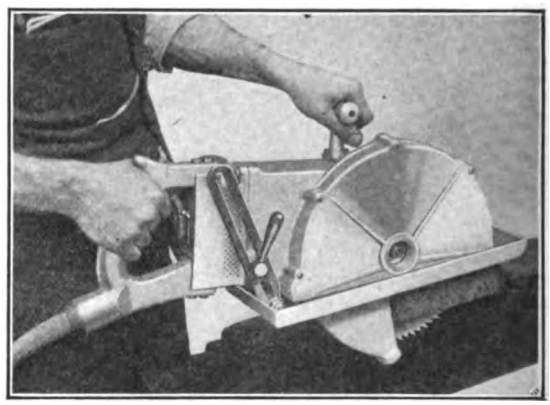
"Standard of the Mechanical World"

A Portable Electric Hand Saw

A PORTABLE electric hand saw is being manufactured by Wappat Gear Works of Pittsburgh, Pa., for use on construction jobs and in industrial plants where there is lumber to be sawed.

The outstanding feature of the Alta Saw, as it is called, is the safety guard. Safety is a very important factor in a tool of this kind. A circular saw, whether idle or revolving, is dangerous. The blade is completely enclosed by a telescopic guard which automatically opens only when the saw is pushed into the material. It automatically closes again as the cut is completed. This guard affords maximum safeguard against accident and protects the blade from damage.

The wide carrying shoe supports the tool and prevents tipping, thereby limiting the operator's effort to mere



guiding. A blast of air from the motor ventilating fan is directed to the front of the saw to blow the sawdust away. This keeps the path of the saw clear and enables the operator to cut accurately to a line. The shoe is adjustable, making it possible to set the saw for any depth of cut such as is required when cutting out sections of flooring, etc.

The motor is of the universal type which operates on either alternating or direct current. Tapered roller bearings and a very efficient quiet running worm gear drive insure maximum power at the saw blade with minimum wear and without vibration.

A Handy Weight

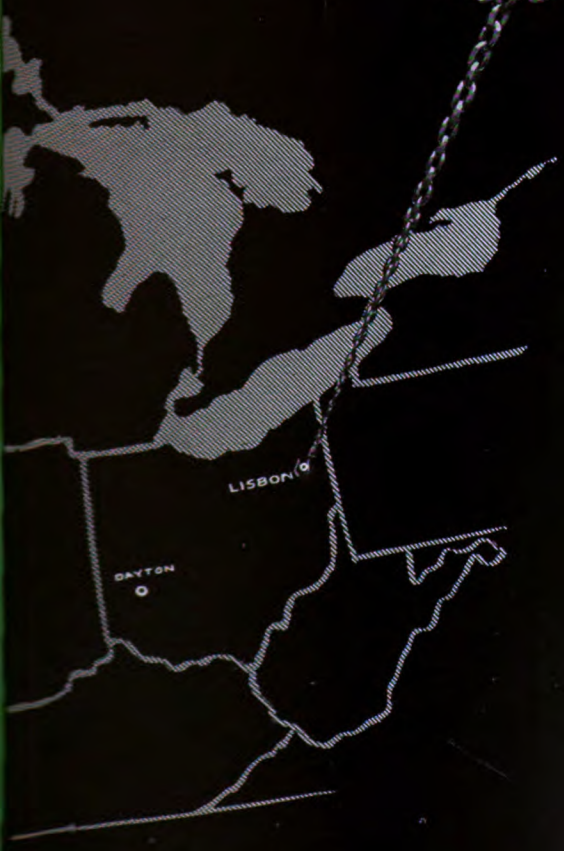
By W. F. Shaphorst

SOMETIMES it is desirable to press a sticker or gummed label upon an uneven surface or to do similar pressing on uneven surfaces. There is hardly anything handier for this than a small bag of fine shot. Mercury is better but of course mercury is much more expensive. Mercury can be held in a bag the same as shot. When extreme pressure is wanted the bag of shot may be placed between the surface to be pressed with an additional weight on top. This is evenly distributed over the entire area; something that cannot be accomplished with a flat pressing surface or even with ordinary soft surfaces. A bag of shot kept about the desk or about the home often comes in handy.

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The WRIGHT Brothers
of Dayton, Ohio
gave to the world
the first perfected
flying machine







The WRIGHT Brothers of Lisbon, Ohio

gave to the industrial world
the first

Highly Perfected Chain Hoist

The hoist with at least twenty-one scientific features—21 reasons why you should specify a

WRIGHT

IMPROVED HIGH SPEED HOIST

And here are the reasons →

The best jobbers can supply you.

STAFF

21 Points Plus of Hoist Superiority found in the WRIGHT

1 TIMKEN TAPERED ROLLER BEARINGS
Eight to each trolley.

2 STEEL SIDE PLATES
Bumpers protect wheel flanges and treads.

3 CHILLED TREAD WHEELS
Absolute roundness insures ease in handling load.

4 STEEL EQUALIZING PIN
Permits placing trolley on I-Beam at any point and insures equal distribution of the load on the four Wheels.

5 STEEL HANGER PLATE
May be eliminated and hook hung on equalizing pin to save headroom.

6 STEEL HOOK—DROP FORGED—PROOF TESTED
The strongest part of the hoist. This hook never opens to drop the hoist and load.

7 STEEL DROP FORGED CROSS HEAD

8 SAFETY LOAD CHAIN GUARD
Completely shrouds the upper half of load wheel, holding six links of load chain in wheel at all times.

9 STEEL LOAD WHEEL
Special analysis electric steel casting, annealed.

10 OIL TUBES
To insure positive and easy lubrication at vital points.

11 MAIN DRIVING SPINDLE AND PINION
Upset forging S.A.E. steel 1035 —heat treated.

12 BRONZE BUSHED LOAD SHEAVE

13 BALL BEARING DRIVING SPINDLE
Where speed is greatest. Not subjected to heavy and shock loads. Eliminates wear on this part.

14 STEEL SUSPENSION PLATES
An extra precaution to care for heavy overloads.

15 NON FOULING HAND CHAIN GUIDE
(Malleable Iron)

16 GEAR COVER—EXTRA HEAVY
Pressed from ⅛" plate. Insures permanency.

17 STEEL CHAIN—ELECTRIC WELDED
Special heat treated and proof tested. An elastic limit 4½ times rated capacity, and breaking strength 6½ times rated capacity

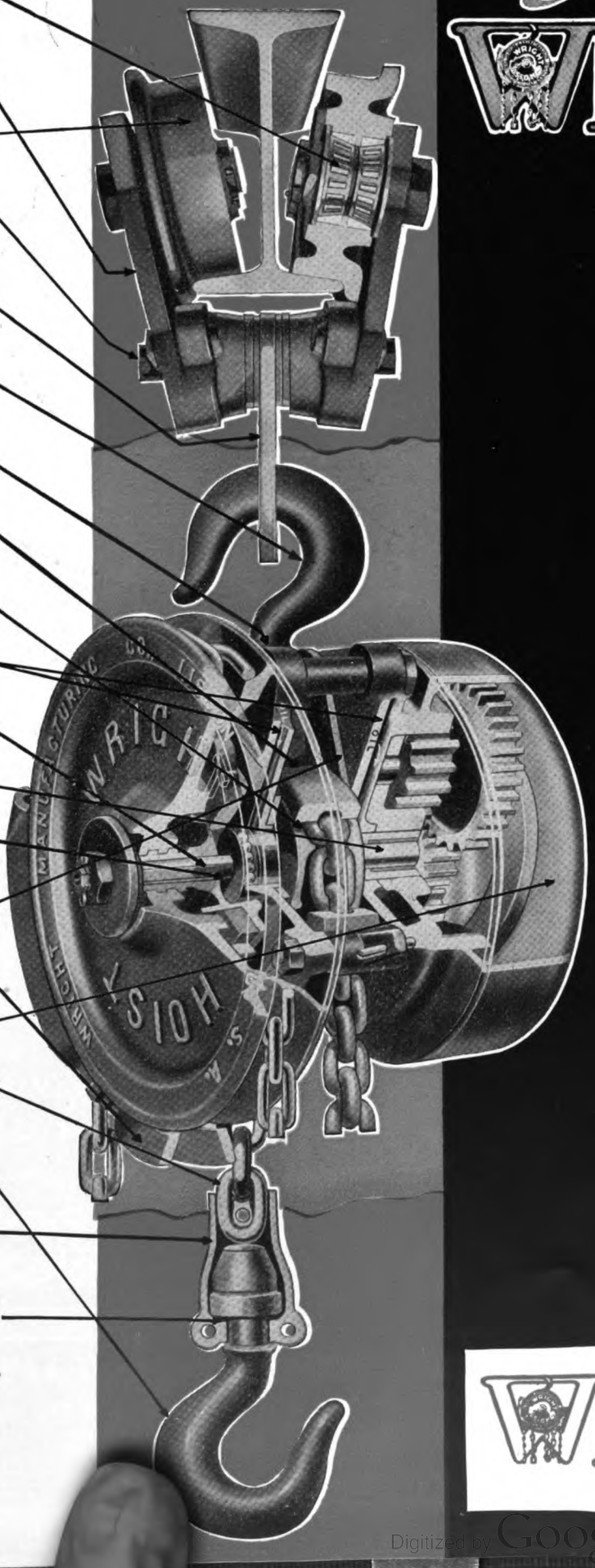
18 STEEL HOOK—DROP FORGED —PROOF TESTED
Never opens to drop the load.

19 DETACHABLE STEEL COUPLING—DROP FORGED
Completely enclosed Ball Bearing. Easily detachable to renew chain. Load is *not* held on connecting bolts but by the forgings.

20 BALL THRUST BEARING ON BOTTOM SWIVEL HOOK
Permits easy swiveling of load. Insures load chain hanging straight and feeding perfectly straight into load sheave pockets. This insures longer life to chain and wheel the greatest point of friction and wear.

21 OIL CUPS SPRING COVER IN ALL OIL HOLES

Ask Us About Them



WRIGHT MANUFACTURING COMPANY

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Production costs can be lowered this way—



The BUFFALO Slow Speed Exhauster shown here is guaranteed to save at least 20% in power over any other fan of equivalent capacity. Its heavy steel construction, large, well lubricated bearings and exceptionally slow speed make this fan efficient, quiet and exceptionally lasting. For exhausting chips, dust, filings, shavings, lint, etc.



For removing smoke, fumes, emery dust, etc., use the "B" Volume Exhauster shown here. Solid shell construction, large bearings and efficient design are responsible for the popularity of this fan. Also made for blowing forge fires, cupolas and many other purposes.



The type "E" Electric Blowers are used for any work requiring a concentrated steady blast of air. They are made in a complete line of sizes, and have features found in no other make of fan. Type "E" Blowers are especially suitable for unusual or experimental work.

In striving for lower production costs, do you take into consideration the economies that can be effected in the operation of "non-productive" equipment?

Have you checked up on the cost of operating blowers and exhausters in your plant, and do you know whether or not you're paying an exorbitant price for their service? Are you entirely familiar with what can be done with air in your plant, if it is properly harnessed?

Many large concerns find that undreamed of economies follow the overhauling of their exhaust systems. By installing efficient, reliable Buffalo blowers they move materials quickly and effectively at low cost.

Sometimes working conditions in certain departments are such that there is a high labor turnover. Buffalo Exhaust Fans installed there remedy this evil by removing foul air, smoke, fumes and dust.

Where forges are used, the installation of Buffalo equipment marks a decided improvement in working conditions and production, and usually saves valuable space.

In many unusual as well as common uses Buffalo Fans and Blowers are serving Industry—energizing air so that it becomes a helpful agent—keeping things "on the move," reducing the labor turnover by making working conditions more desirable—and in a dozen other ways contributing to the productive output of factories.

Our experience in adapting fans to the requirements of thousands of users is yours for the asking. Just a line stating your particular problem and we'll gladly make recommendations and quotations on the necessary equipment. If you are interested in our entire line of fans and blowers ask for catalog No. 860.

Other Products that reduce costs

Other Products we make include forges, drills, punches, shears and bar-cutters, both hand and power operated, complete heating and ventilating equipment including unit heaters, mechanical draft apparatus, spray nozzles, and other items.

WRITE FOR CATALOG

Buffalo Forge Company

470 BROADWAY, BUFFALO, N. Y.

In Canada: Canadian Blower & Forge Company, Ltd., Kitchener, Ontario

"Buffalo" fans for all services

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The KEYSTONE of INDUSTRY



TRANSPORTATION

Just as transportation by rail, boat, truck, etc. is the keystone of the industrial structure, so transportation by locomotive crane, hoist, etc. is the keystone of shop operation.

Without adequate transportation, big production in any shop is impossible for ninety per cent of production *is* transportation. Without dependable transportation no shop can maintain the production schedules of which it is capable. Without economical transportation no shop can get its costs down where they ought to be.

Is your plant adequately equipped with cranes? Are they dependable? Do they operate at minimum cost? If any of your answers are negative, our engineers can render you a real service in studying your needs and making recommendations. No obligation, of course.

Bulletin 200 describes Whiting Cranes in detail.

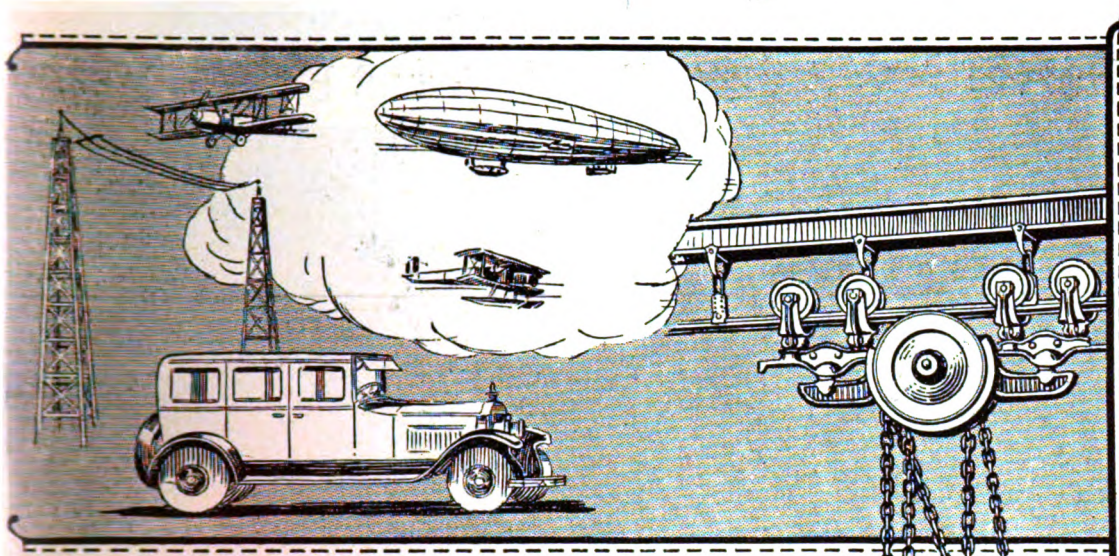
WHITING CORPORATION
HARVEY · ILLINOIS
[CHICAGO SUBURB]

WHITING
CRANES *for shop efficiency*

IC-1-Gray

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Time has answered these questions *for* Industrial executives

Could Marconi's first radio have transmitted Marion Talley's voice in all its purity? Could Orville Wright have flown in his first aeroplane to the North Pole and back? Could the first automobile have sped from coast to coast in less than five days?

Could the first Louden Monorail System have been as complete and efficient as it is today? Was it born full grown? No. Like every great improvement it had to run its course of development. Only after years of painstaking development has it reached its present high state of efficiency.

Quietly and with its triumphs unsung, Louden Monorail has been reclaiming that last great trackless waste of American industry—the unused ceiling.

In factory and warehouse, in garage, foundry and mill, the Louden Monorail has made the ceiling the right of way for a carrying system that handles *any* type of raw material or finished product up to 2000 pounds in weight.

It has eliminated trucking and congestion, back-breaking lifting and stoppages in production. It has reduced costs and insurance risk. It has speeded production. It has made possible amazing savings in time, wages, labor turnover and breakage. And it has been able to do all these things only because, with the *test of time*, the Louden Company has made the Louden Monorail System adaptable to every handling need and every business.

Everywhere, from the few feet needed in a garage to the miles used in mammoth plants, Louden Monorail is proving to be one of the greatest sources of economy—and greater dividends.

Write Us To Send Our Nearest
Louden Monorail Man

Who is the Louden Monorail Man? He is an expert in solving material handling problems and the planning and installation of material handling systems. His service is free and involves no obligation

Forest Crissey
The well known industrial investigator and writer says:



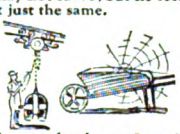
This is evidence enough to convince any alert and open minded manufacturer that his plant is not too small to put in equipment that will save a very material portion of what he now pays for carrying materials within his plant.



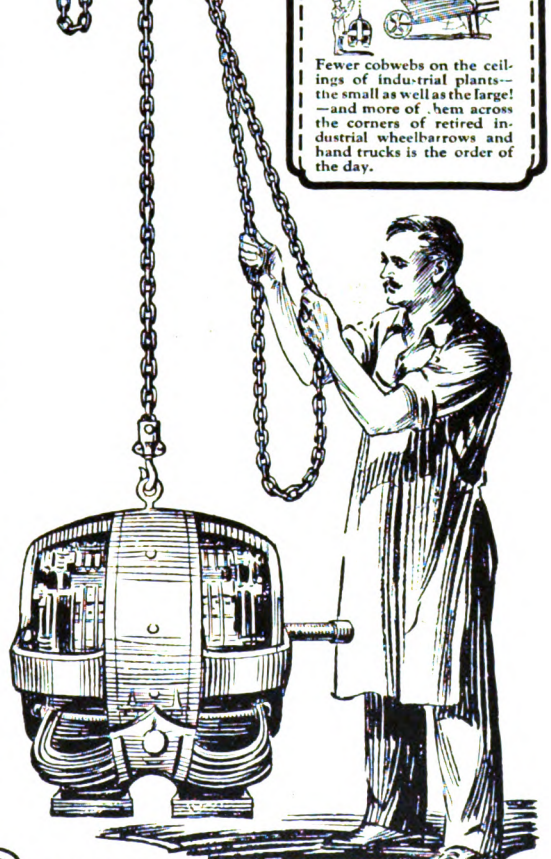
Quoting a workman: "Listen to it. That's music to me. Trundling heavy wheelbarrows is mighty poor entertainment compared with what you get from a thing that does the work and just merely asks you to put a hand to its shoulder as it moves along".



When you take a man from mule work and give him a chance at a man's job, he is just naturally grateful. He may not say so, but he feels it just the same.



Fewer cobwebs on the ceilings of industrial plants—the small as well as the large!—and more of them across the corners of retired industrial wheelbarrows and hand trucks is the order of the day.



The LOUDEN MACHINERY COMPANY
(Established 1867)
599 West Avenue Fairfield, Iowa
Albany Boston New York Philadelphia Buffalo Pittsburgh Cincinnati Cleveland Toledo Detroit Chicago St. Paul Los Angeles

LOUDEN

INDUSTRIAL MONORAIL SYSTEMS
for Overhead Lifting and Carrying

The LOUDEN MACHINERY CO. 599 West Avenue Fairfield, Iowa

☐ Check in this square — Without obligation to me, I would like to see a Louden representative at my office.

(date) _____

☐ Check in this square — Send literature picturing and describing Louden Monorail Installations.

Name of Company _____

Attention of _____

Address _____

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BRINGING THE TEMPERATURE TO YOU



MOTOCO
INDUSTRIAL THERMOMETER

Temperature checking may be made an easy job by the simple expedient of bringing the reading to you.

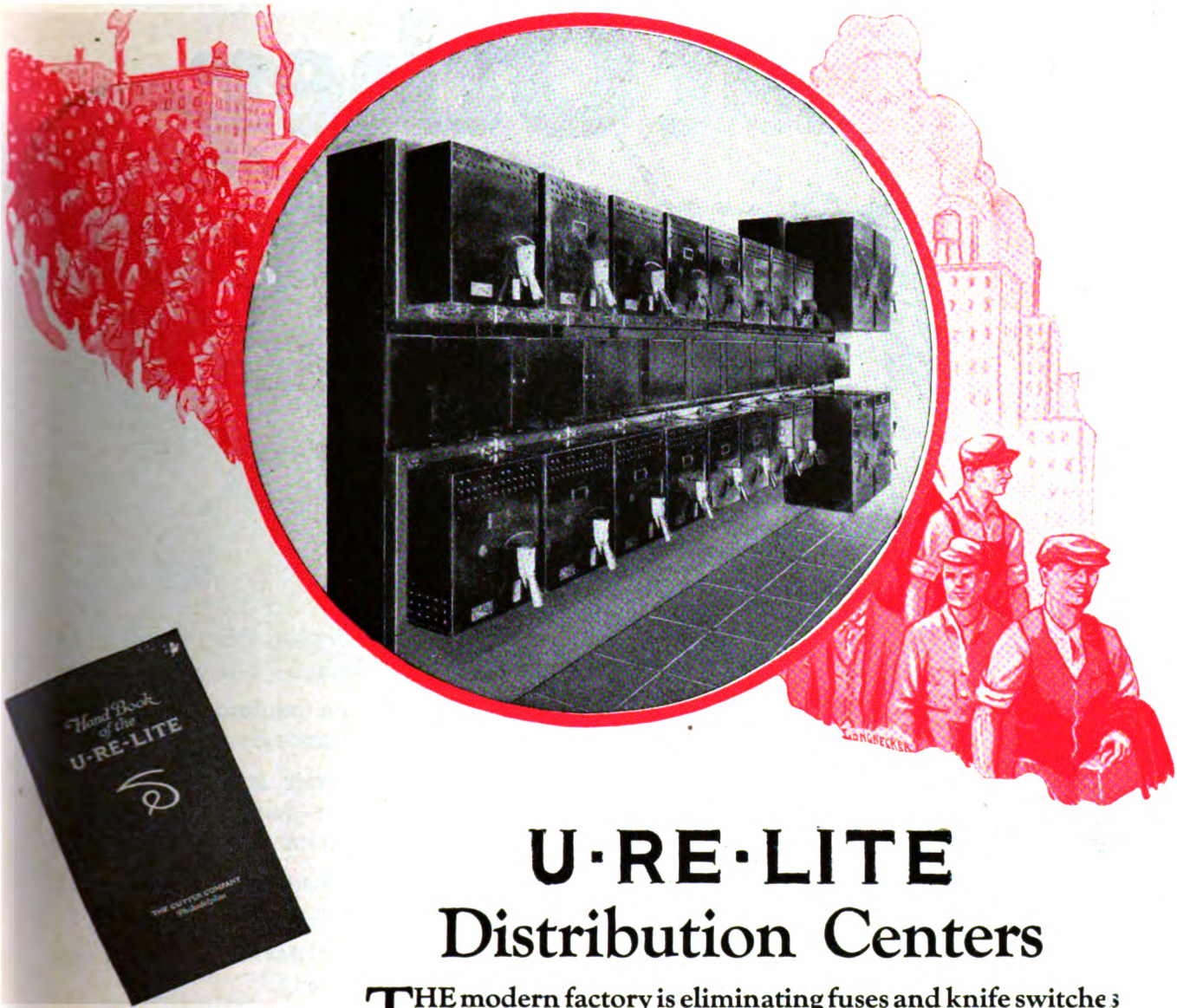
In this way a thermometer that should be read often will not be neglected. The Motoco Industrial Thermometer takes all the inconvenience out of temperature checking.

If yours is a product dependent on proper temperature control, Motoco will improve it. Catalog No. 9 tells the whole story.

The Moto Meter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.
The Moto Meter Co. of Canada, Ltd., Hamilton, Ont.
National Gauge & Equipment Division, La Crosse Wisc.

The industrial division offers the services of its engineering staff to manufacturers requiring thermometer equipment.
The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

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"First to the left—
Then to the right—
Turn the handle
And U-Re-Lite."

Write today for the U-Re-Lite Hand Book—96 fully illustrated pages of electrical protective data. Mailed free on request.

U·RE·LITE
Distribution Centers

THE modern factory is eliminating fuses and knife switches as rapidly as possible. The installation of U-Re-Lites, grouped as illustrated above, makes the most dependable and efficient form of electrical protection. It entirely eliminates the possibility of fires, accidents and lost production due to blown fuses. It gives protection that is positive, adequate and economical.

Rupturing Capacity

A copy of the U-Re-Lite test recently conducted in Cincinnati, demonstrating the ability of U-Re-Lite to successfully and repeatedly rupture short circuits of tremendous magnitude, will be forwarded on request.

CUTTER

U-RE-LITE · · · I-T-E CIRCUIT BREAKERS

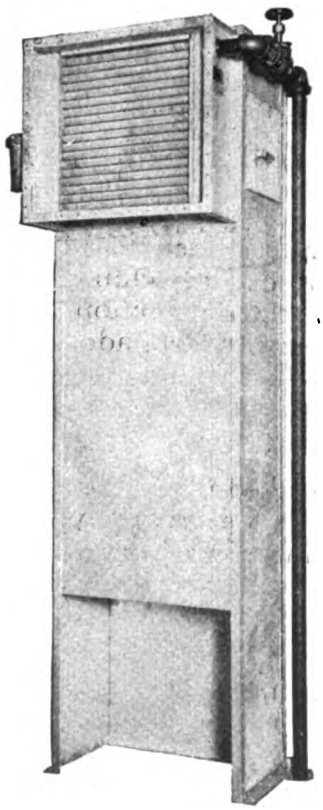
THE CUTTER COMPANY—*Established in 1888*—PHILADELPHIA, PENNSYLVANIA

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The Venturafin METHOD OF HEATING



1. More than 5 times the heating efficiency of direct radiation.
2. One-tenth the weight of direct radiation.
3. One-fourth the space of direct radiation.
4. Much less time to install than direct radiation.
5. Positive heat in the most severe weather.
6. Even distribution of heat.
7. The ability to heat up more quickly than direct radiation.
8. Adaptable to practically any position without loss of efficiency.
9. Considerably less heat loss through walls than direct radiation.
10. Low cost of installation.
11. Considerable saving in fuel.
12. The minimum of maintenance costs.
13. Copper and brass coils, non-corrosive, non-breakable.
14. Portability without great expense.
15. Ventilation as well as heating.
16. No alterations to install.
17. Applicable to practically any heating need without special construction of units.
18. Practically indestructible.
19. Simplicity.
20. Ease of control.

Write for Complete Data

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

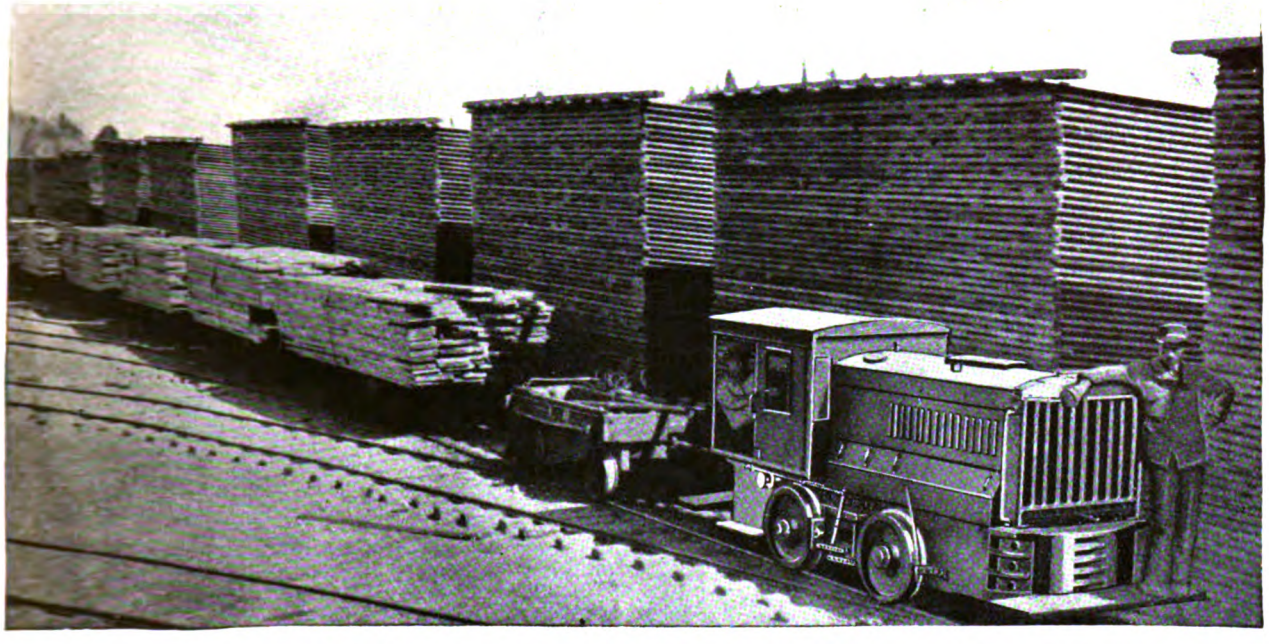
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American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

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Plymouth 7-ton gasoline locomotive in use at Weed Lumber Co.'s plant at Weed, Calif.

"The Service has been Wonderful"

WHEN the Weed Lumber Co. (subsidiary of the Long-Bell Lumber Co.) of Weed, Calif., bought their first Plymouth Gasoline Locomotive they met with two surprises. First, in the tremendous power developed, and, second, in the big economy of operation and upkeep.

Plymouths save not only in fuel—they are always ready, there is no fire hazard, no "stand by" expense, and they are as simple as an automobile to operate.

If you want Power, plus Economy and Efficiency, do as thousands of others are doing—adopt the Plymouth.

THE FATE-ROOT-HEATH CO.
232 Riggs Avenue, Plymouth, Ohio

WEED LUMBER COMPANY
WEED, CALIF.

April 19, 1926.

The Fate-Root-Heath Co.,
Plymouth, Ohio.
Gentlemen:

Presume you would like to know what we think of the performance of our Plymouth 7-ton Gasoline Locomotive. Although it is practically new, having been in operation only about seven months, the service has been wonderful and has very much exceeded our expectation. It has been in continuous service about nine hours per day, six days a week ever since we began operating it. We haul an average load of about 100,000 pounds on grades from 1 to 5% without any difficulty.

We also figure that the fuel consumption is much less than would be expected of the heavy duties that this machine performs.

Yours very truly,
WEED LUMBER COMPANY,
(Signed) W. P. Sexton,
General Superintendent.

Made in 3 to 25-ton sizes and in any track gauge.

PLYMOUTH
Gasoline Locomotives

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When you're "20 Miles from Nowhere" on a "He" job—you'll surely need

WILLIAMSPORT WIRE ROPE

Telfax Tape Marked

Because:

You'll want to **know** the tensile strength of the wire rope you're using. Williamsport—alone—gives you this proof.

That's why "Monighan Walkers" are equipped with Williamsport Wire Rope —Able Engineers declare that taking chances on any part of their equipment particularly on isolated jobs is poor business efficiency, to say the least. They just won't do it. Others must go through the bitter experience of a tie up or accident to be convinced.

Most manufacturers of good machinery on which Wire Rope is a part of the equipment use Williamsport for your protection.

Your safety is paramount to a slight difference in cost in the minds of these manufacturers.

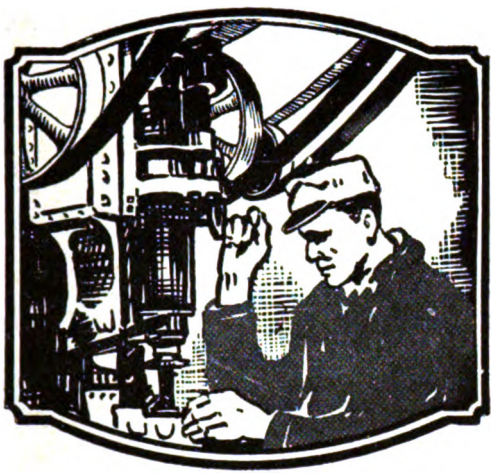
WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
Williamsport, Penna.

General Sales Offices
Peoples Gas Building, Chicago

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SCHIEREN BELTS DO LAST LONGER



Duxbak Belting is more pliable because there's no grit in the leather

IT'S just as hard for a starchy, grit-filled belt to bend around pulleys as it is for the traditional fat man to bend over. The one produces friction and the other produces discomfort.

Many a Duxbak Belt has lived to be old enough to vote. It's just because their fibres are clean and no amount of hard running can set up internal friction. Ask a Schieren salesman about it—or write us.

Let us send you a copy of L. H. Hopkins' article, "Group Drives More Economical for Most Conditions."

DUXBAK BELTING TRADE MARK

Chas. A. Schieren Company ESTABLISHED 1844

Tanneries: Bristol, Tenn.

Main Office and Factory
31 Ferry St., New York

Distributing Branches and Dealers in All Leading Cities Throughout the World

DUXBAK WATERPROOF LEATHER BELTING

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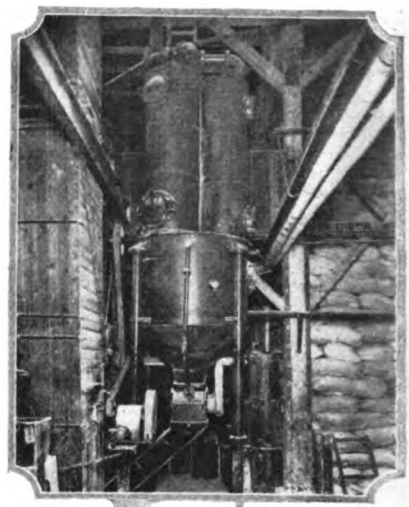
One Man Handles Soda Ash Over a Distance of 125 Feet

A manufacturer of soap and toilet preparations, in fact, one of the largest and best known in the field, now handles soda ash pneumatically, the DRACCO way.

Formerly, a big gang was required and the conditions proved injurious to the health of the workers.

The DRACCO System installed here requires but one man to do the entire handling from cars to bins and the soda ash is conveyed at the rate of 10 tons per hour without a particle being wasted.

DRACCO Systems handle all kinds of bulk, granular and dusty materials. We have a number of bulletins describing various DRACCO installations, which will gladly be sent on request. No obligation.



Dust Recovering & Conveying Co.
Harvard Avenue and East 116th Street
Cleveland, Ohio

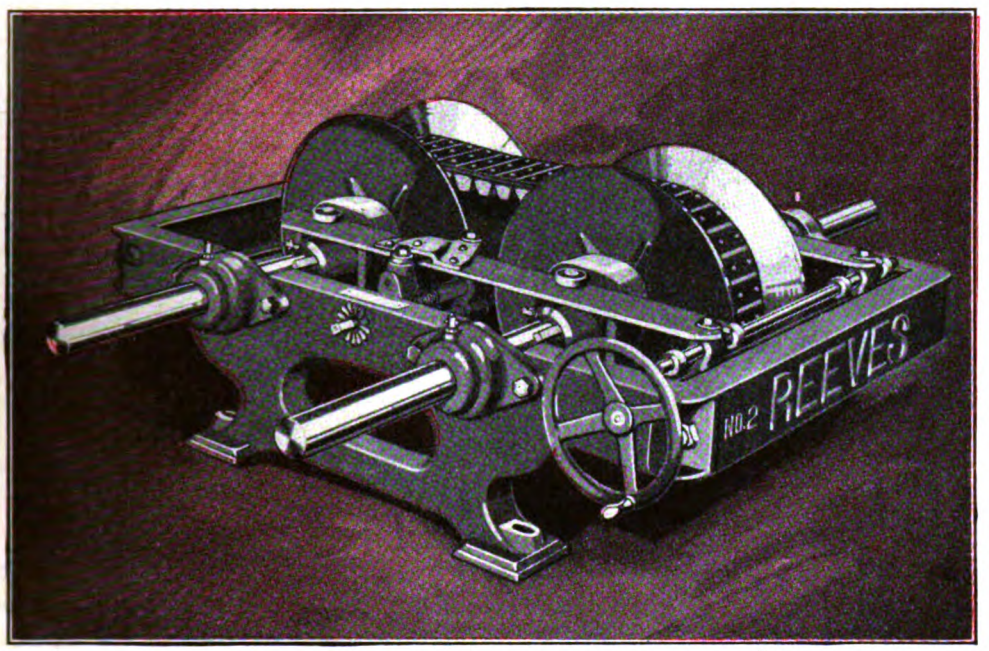


DRACCO DOES IT

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Here Is the Simple Machine Which Gives the Vital Flexibility



The REEVES Variable Speed Transmission

HERE is an inexpensive, simple, compact device which has proved its tremendous value in practically every industry. It receives power at a constant speed and delivers it at *any* speed to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to *any* speed desired.

During the past ten years, over 40,000 REEVES Transmissions have been installed in leading industrial plants throughout the world. This device represents the *only* method which gives *absolute* speed flexibility. It does not give just *steps* in speed—but *any* speed between the fastest and slowest, even to the smallest fraction of a revolution.

Mail us the attached coupon. We will be glad to show you the REEVES applications in your industry—the names of your fellow manufacturers who use the REEVES, and the actual figures on the necessity for speed flexibility.

Speed Flexibility Is VITAL!

REEVES PULLEY COMPANY
Columbus, Indiana

☐ Send me detailed information about REEVES in the _____ industry.

☐ Send me your new catalog MN-66, the authority on speed flexibility.

☐ Tell me the economical advantages of the REEVES over a variable speed motor.

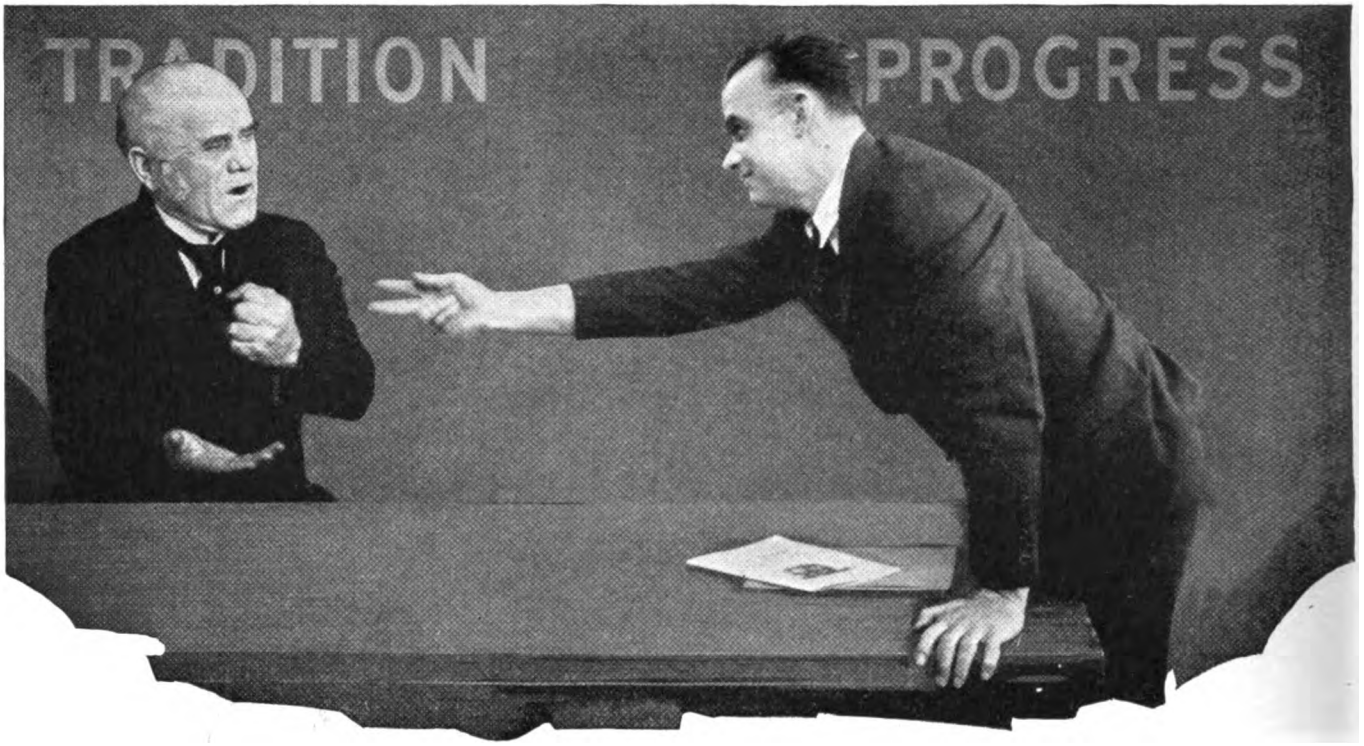
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Pop is Still Dragging His Heels

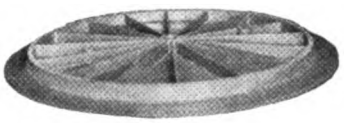


"See here, lad—

you're wasting a lot of valuable time figuring up stunts for our machine design—that machine was designed before you were and time has proved that it's right . . . so why figure up changes . . . Being young, you're a faddist."



The standard steel shapes shown above were arc welded into a single piece to form the turntable top shown below.



"Sure, Pop—

. . . that's what they called young Bessemer when they ruled his papers out of a steel convention in England. He ignored practices that were sanctioned by years.

And what I'm trying to do is to incorporate a *little* Bessemer steel in place of a *lot* of cast iron into our machine base. A Stable-Arc welder, such as used in thousands of plants, can build us a better base at a fraction of our present cost.

What do you want me to do . . . 'waste time' in modernizing our machine and reducing its cost . . . or waste money in producing it in your good old-fashioned way?

Snap into the march of progress and get the whole story on redesigning for arc welding from Dept. 17-1."

The Lincoln Electric Co., Cleveland, Ohio

WC-3

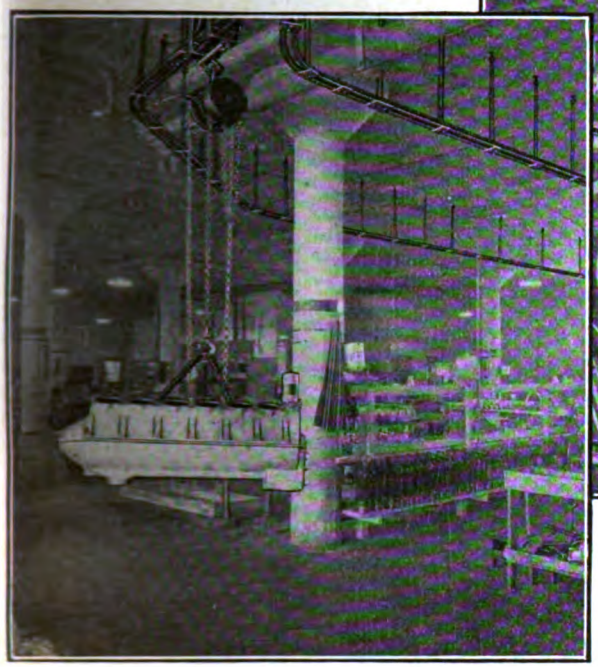
"Stable-Arc"

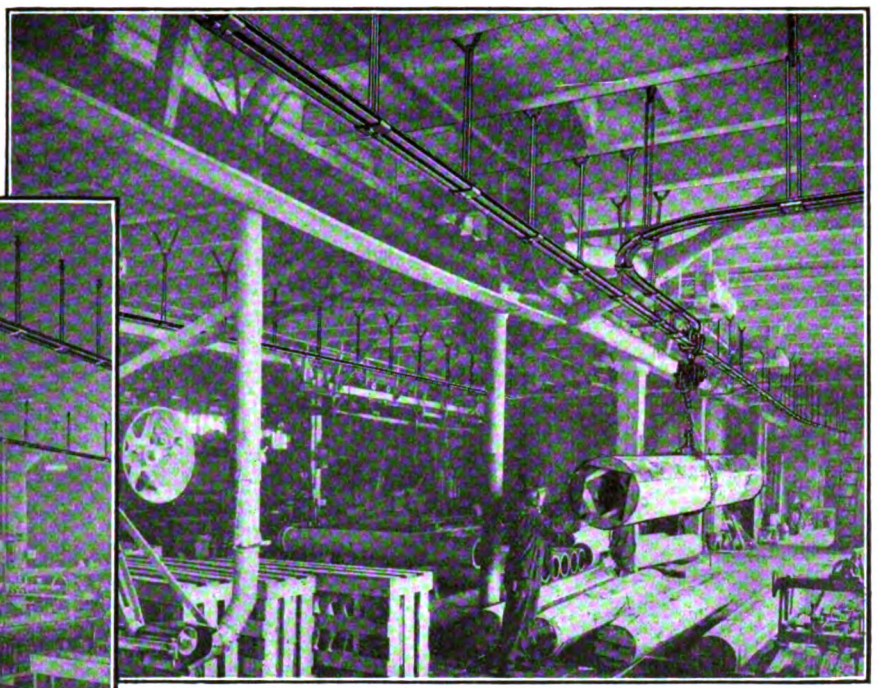
LINCOLN WELDER

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for Sharp Curves Short Turns and Awkward Loads





The DUO-RAIL System meets all conditions

The DUO-RAIL System of overhead conveying of parts and products has eliminated a great deal of the inconveniences and loss of time, whenever long, heavy, awkward loads were handled around curves. With the mono-rail, short turns were almost impossible.

The DUO-RAIL System, the application of the railroad principle in industrial handling, handles the most awkward materials around the sharpest turns with dispatch and ease. The rails in the DUO-RAIL System are staggered, exactly as in the railroad track. It results in safer, steadier, more efficient handling, with absolute freedom from vibrations and sudden jars when materials are handled around sharp turns.

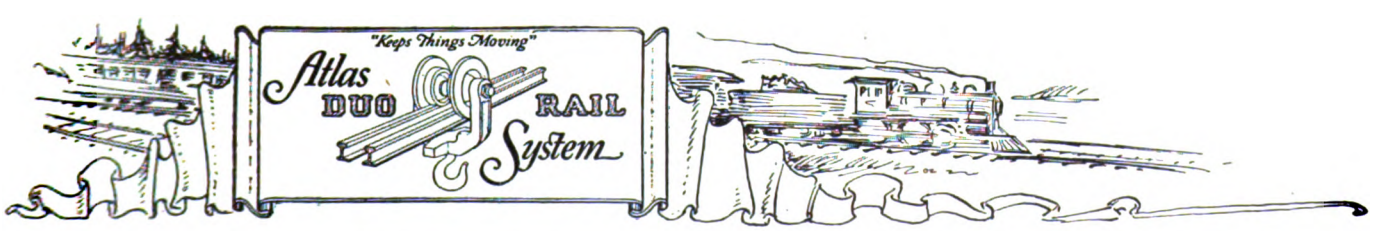
We will gladly explain in detail how the DUO-RAIL System can be applied to any department of your plant. Write for "The ATLAS of Mechanical Conveying."

Write for the New Book



"The ATLAS of Mechanical Conveying." It is free.

The ATLAS-CHICAGO COMPANY
Division of Chicago Electric Company
740-744 West Van Buren St., Chicago



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45c a Day Buys—More Production, Less Spoilage, Fewer Accidents

THREE months after its illumination was brought up to proper standards, the Smith & Lovett Company of Boston wrote of the following benefits: (1) Decreased loss from material spoiled due to mistakes; (2) Fewer accidents; (3) Faster and better layout of work from blue prints; (4) Better appearance of plant and better feeling among employes.

All of the 15,000 plants which improved their lighting last year made worthwhile savings.



BEFORE—The camera shows light in the air, but not on the work where it belongs.

AFTER—Proper reflecting equipment throws the light to the place most needed.

The Edison Electric Illuminating Company helped so many factories last year to gain benefits from improved lighting that it won a contest conducted by this Committee. Your electric light company is anxious to help YOU.

Industrial Lighting Fact No. 3

You, too, can increase your production by bringing your lighting up to the proper standard. Without cost your local electric light company will gladly show you how.

Industrial Lighting Committee, National Electric Light Associatio
29 West 39th St., New York

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A Horton Tank Will



50,000-gallon tank at the plant of the Wander Company, Villa Park, Ill. It is standard design except for a special roof.



Ellipsoidal-bottom tank at Canadian Dry Ginger Ale plant. It holds 35,000 gallons for general supply and 40,000 gallons for sprinkler service.

Protect the Plant and Advertise the Product

The most dependable fire protection system is one supplied from an elevated storage. Gravity never fails. When the sprinkler heads open the water flows—with ample pressure and without interruption.

Leading manufacturers are finding in Horton Tanks not only dependable fire protection but also good advertising. The size and elevation of such tanks command attention. They can be built in special shapes or strikingly painted as desired.

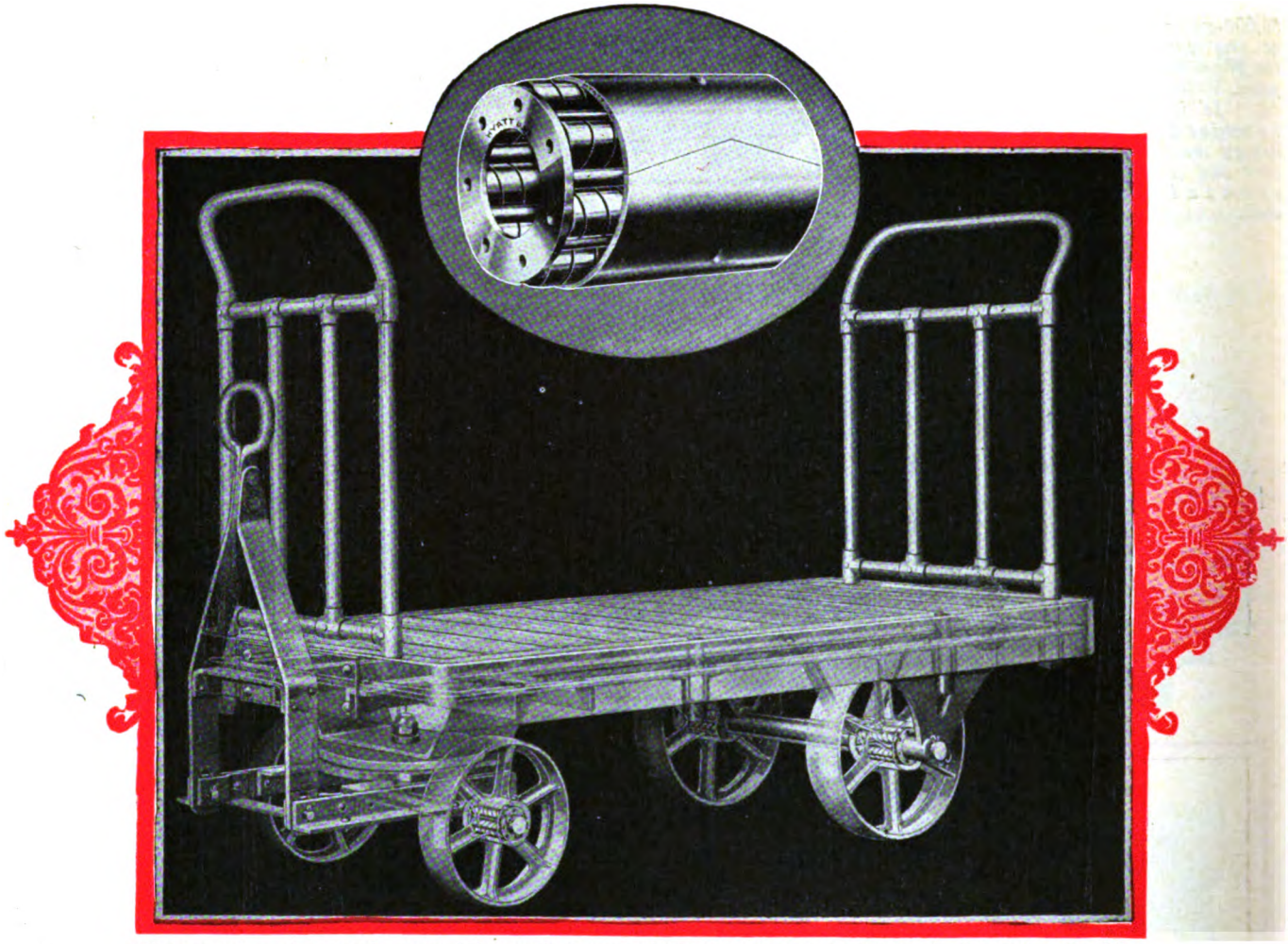
Horton Tanks never rot nor burn. They are economical both for fire protection and advertising. Ask for a quotation or send for the booklet "Horton Tanks for Fire Protection."

CHICAGO BRIDGE & IRON WORKS

Chicago	2465 Old Colony Bldg.	Dallas	1658 Praetorian Bldg.
New York	3169 Hudson Terminal Bldg.	Atlanta	1023 Healey Bldg.
Cleveland	2238 Union Trust Bldg.	San Francisco	1043 Rialto Bldg.

HORTON TANKS

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The Mercury Manufacturing Company of Chicago, Ill., have standardized on Hyatt Roller Bearings for their trailers. In all there are 18 leading truck and trailer manufacturers who build Hyatts into their equipment. Their names will be furnished on request.

Hyattized Mercury Trailers Keep the Loads Moving

MERCURY trailers have become prominent everywhere for giving rapid, dependable service, even under the most exacting working conditions. Hyatt Roller Bearings make the trailers roll easier, for smoother performance and longer life.

The sturdy Hyatt rollers rotate with the wheels in a natural, easy motion. There is no rubbing friction to waste power and slow up the job. The bearings lessen the tug on motors, the wear on other parts.

Hyatt bearings operate practically without wear, and need no repairs or replacements. A little lubricant three or four times a year is the only attention they require.

No other bearing can give you service so smooth, so economical, so lasting, as Hyatt. Specify Hyatts on your next trailer or truck order.

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO PITTSBURGH
WORCESTER PHILADELPHIA CHARLOTTE OAKLAND CLEVELAND

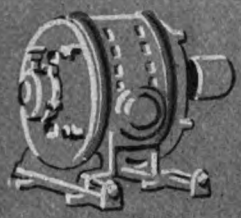
HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

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Public confidence is an asset slow and difficult to build; but once firmly established it becomes doubly valuable; first as an incentive to greater deeds, and second as a possession too priceless to jeopardize.

That is why the Howell Organization places the customer first in every transaction—that is why Howell Red Band Motors are made to conquer the hard jobs—it is the reason there is no temptation great enough to turn this Company from its steadfast policy of never tampering with quality. We know of no other method to give the customer what he has a right to expect for his money.

Howell RED BAND ELECTRIC **Motors**

Howell Electric Motors Company
Howell, Michigan

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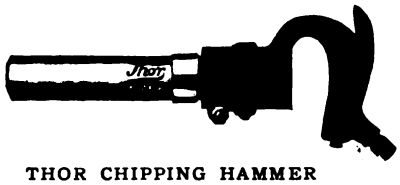


Thor

CHIPPING HAMMERS

Smooth-Running Powerful-Durable

Time is economy and a THOR Chipping Hammer saves a lot of time. It is exceptionally fast, operating at several thousands blows per minute. It has a simple and efficient valve mechanism and works with less vibration than ordinary hammers. It will not readily clog or jam and will give complete satisfaction under severe use. Have you a copy of our catalog in your files? We'd be glad to send you one.



THOR CHIPPING HAMMER

Like all THOR Tools, it is made by men who know the severe service a tool receives under actual working conditions. Economical in operation—efficient in results.

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS — GENERAL OFFICES 600 W. Jackson Blvd. CHICAGO — ELECTRIC TOOLS

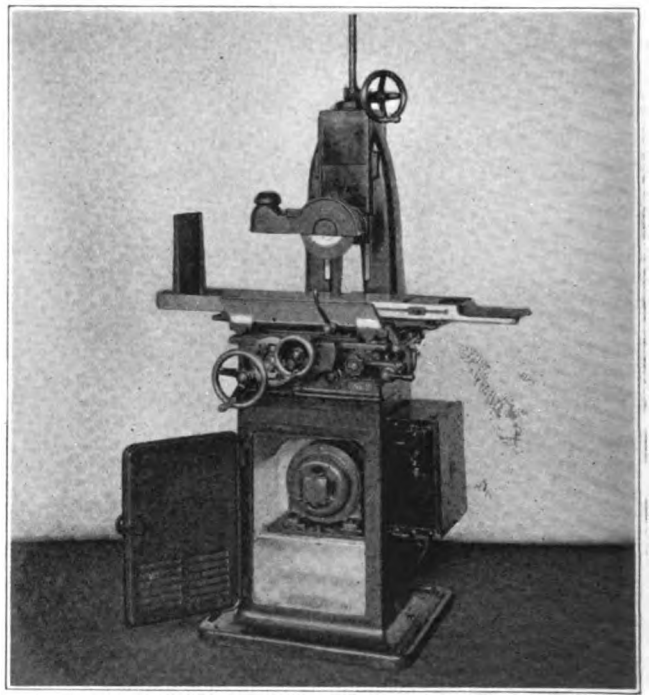
FACTORY AURORA, ILL. — BRANCHES THE WORLD OVER

Eastern Office 1463 Broadway, New York. London Office 40 Broadway, Westminster, London

New Brown & Sharpe Surface Grinding Machine

THE latest addition to the line of "complete-unit" machine tools manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I., is the new No. 2 surface grinding machine, which has the motor enclosed within the base of the machine. In this position the motor is completely protected from oil, water, dust, dirt and other sources of trouble to which motors located on brackets outside of the machines are sometimes subjected. This type of motor equipment has proved to be exceptionally desirable on this machine as it provides a dependable drive in a very compact and convenient form.

The accompanying illustration shows clearly the manner in which the equipment has been applied to the machine. The motor, which is of the constant speed type,



is securely mounted on a plate which is in turn bolted to a shelf in an oil-tight compartment in the machine base. Ventilators cast in the door provide sufficient circulation of air to insure a cool-running motor. Additional space is furnished under the motor shelf for storage of attachments and machine accessories. An option of several makes of motors for either direct or alternating current is given.

Power is transmitted by means of a belt running over a system of pulleys. A tightener automatically keeps the belt at the proper tension regardless of the height of the spindle head. The control box is located on the side of the base with the push-button control in a convenient operating position.

Longitudinal table travel and transverse movements are automatic, the latter being provided with an automatic stop which "throws out" at any desired point. A knurled knob on the front of the machine disengages the power cross feed when only the longitudinal feed is wanted.

The machine accommodates work up to 18 inches long, 6 inches wide and 9½ inches high, when a wheel 7 inches in diameter is used.

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Concrete Floors Made Granite-Hard

THE concrete floors of this great new Power Plant at Sterlington, La., might as well be flint, as far as wear and dust are concerned. They have been made permanently hard and dust-proof by treatment with Lapidolith.

Leading architects and builders have been using Lapidolith for 15 years. It is a liquid, chemical compound that penetrates the porous cement and binds the loose particles together into a fine, granite-like surface that resists wear for a lifetime.

LAPIDOLITH
TRADE MARK

We can refer you to buildings in your city that are still in perfect condition after being treated with Lapidolith years ago. Go and look at them. We are prepared to apply Lapidolith anywhere, through our own service crew, and we guarantee satisfaction to you and your clients. Send coupon below for free samples and literature.

L. SONNEBORN SONS, Inc.
114 Fifth Avenue New York

Other Sonneborn Products

LIGNOPHOL
Wood Floor Preserver and Hardener

CEMCOAT
Washable Enamel Paint

HYDROCIDE COLORLESS
Rainproofs Buildings

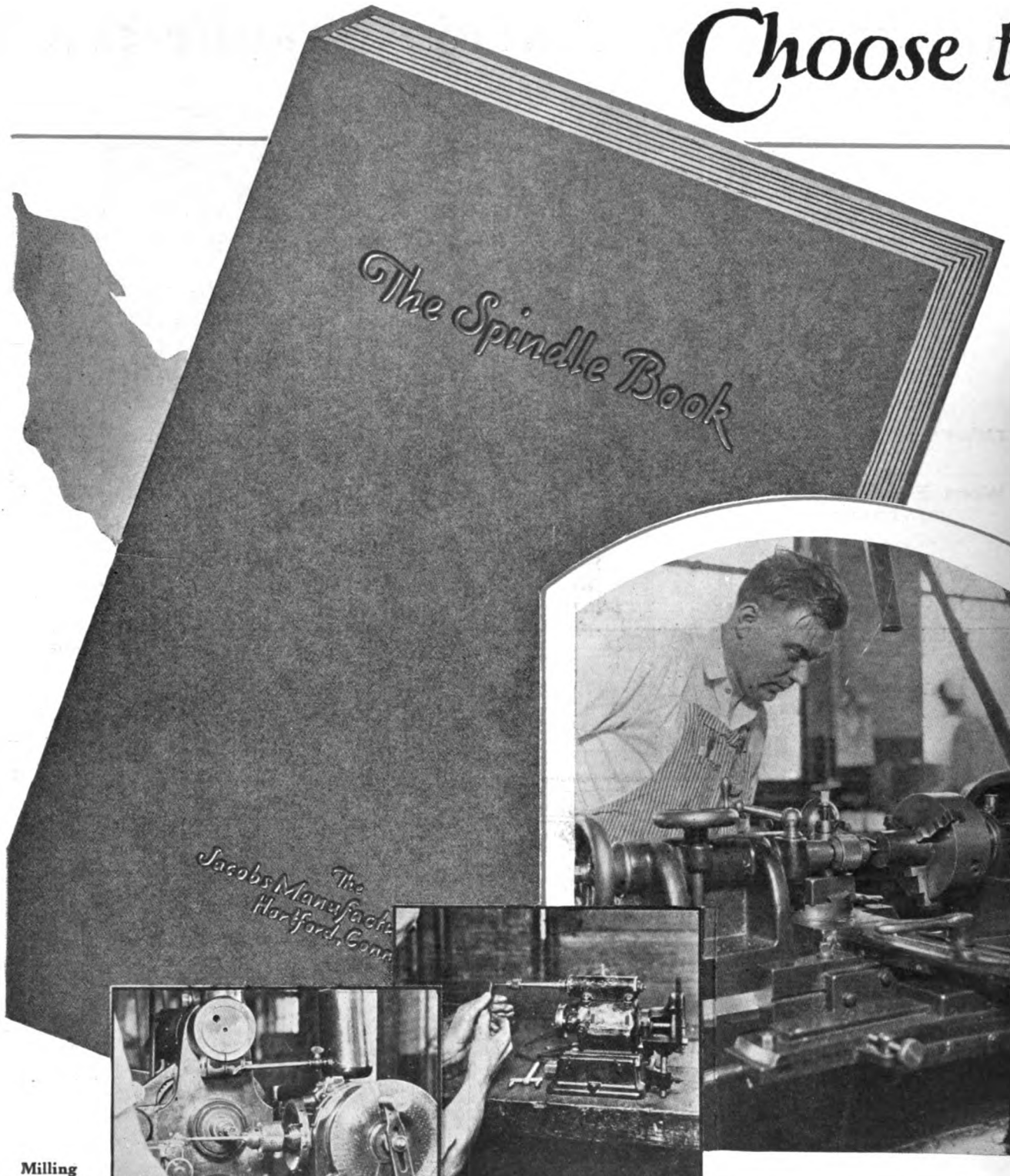
Power Plant of Louisiana Power & Light Co., at Sterlington, La., Ford, Bacon & Davis, Engineers. Lapidolith used on all concrete floors.



L. SONNEBORN SONS, Inc., 114 Fifth Avenue, New York — COUPON
Please send me, without obligation, demonstration samples and literature on ☐ Lapidolith ☐ Lignophol ☐ Cemcoat ☐ Hydrocide Colorless ☐ (Check products that interest you.)
Name .....
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Company .....
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Choose the



Milling Flutes in Reamers or Taps.

A Small Chuck for Light, High Speed Drilling or Burring.

Drill chuck with Tapered Shanks for Centering Operations.

The Jacobs Manufacturing Co.

HARTFORD, CONN.

The World's Largest Producers of Drill Chucks

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Right Chuck for the Right Job

The Spindle Book Tells How!

Five Different Sizes of Chucks in a Turret Lathe.



Lapping Operation in Small Engine Lathe.





n Some Cases, Two Chucks are Neces- ary.

For Tapping Operations.





A Drill Chuck driven at High Speed for Lapping Small Bushings.

Look up the machine you are using in The Spindle Book—it will tell you the exact spindle specifications.

The Spindle Book is a handy reference book, containing a great deal of valuable information and will save you needless waste. A copy is yours for the asking.

Jacobs Chucks are easily operated, quick acting, positive grip—making it possible to operate machines without danger of tool slippage or marred drill shanks.

Send for your copy of The Spindle Book.

Jacobs Quality Chucks

Fill in cut out and mail

COUPON

THE JACOBS MFG. CO., Hartford, Conn.

Please send me a copy of your new Spindle Book.

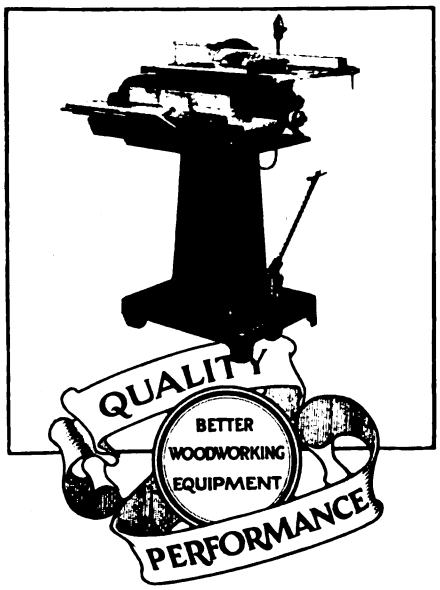
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UNION MACHINES ARE BUILT TO REDUCE COSTS

Confronted with increased competition, manufacturers are paying more attention to lowering their costs. More expensive and costlier machinery must give way to the more economical and efficient. Manufacturers are choosing Union Woodworking machines because it has been clearly proven that they reduce costs considerably. One Union Machine will do the work of five men—reducing labor costs.

They will do your work at half the cost of larger and more expensive machines—a saving in first cost and operating expense. Depreciation is less, so is insurance and upkeep. They are compact, rugged and speedy. Union Machines are portable, easily moved from one department to another. Where more efficient operation and lower costs are necessary to yield a good profit, Union Machines are being used. Write today.

Send for catalog—It's Free!

GALLMEYER & LIVINGSTON COMPANY
412 Straight Ave., Grand Rapids, Mich.



slip!

A slip of the belt is no fault of the belt

TIGHTENING the belts does not prevent belt slip. This is a scientific fact. Cling-Surface preservative absolutely prevents slipping and enables you to run the belts slack, thereby increasing the arcs of contact, preventing hot-boxes, and often quadrupling the life of your belts. Besides, Cling-Surface prevents a large per cent. of shutdowns. The coupon represents an opportunity for you to effect large savings of power. In addition it will bring you the means of saving belts, machinery, fuel and money. Mail it today.

Cling-Surface — preserver of belts—has been made for thirty years by the only company whose sole product is belt treatment. It is used in every country of industrial importance in the world. It saves belts and machinery. It increases transmission efficiency and prevents all loss due to slipping.



CLING-SURFACE COMPANY
PRESERVES BELTS—ELIMINATES BELT SLIP

FREE 60 Day Return Privilege COUPON

Conditions in our plant are about as checked:

☐ cold ☐ hot
☐ damp ☐ dry
☐ dusty ☐ clean
☐ 3 gal. Tin at $3.40 gal.
☐ 6 gal. Tin at $3.25 gal.
F. O. B. nearest Warehouse.

Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Gentlemen: I am always willing to give a belt-saving, money-saving proposition a trial on its own merits. Send tin to fit conditions noted and of the size checked. If need be, I shall use the entire contents. If satisfactory I shall pay in 60 days. Otherwise no pay.

Company ..... Attention.....

..... II-12-26

Conveyor Belt Lubrication

By E. I. Bell

ONE of the most costly elements buried under that bothersome caption "overhead" is the lubrication of conveyor belts. The widespread use of these materials handling units in the scheme of modern production has been followed by the development of lubrication systems of remarkable efficiencies.

The introduction of anti-friction bearings solved the lubrication problem to some extent. But, it has been demonstrated time and time again that one application of lubricant to ball or roller bearings will not last indefinitely. They require care and attention. Not as frequently, of course as plain bearings, but nevertheless individual lubricating, if the efficiency of the conveyor is to be maintained.

The grease cup has its place, but for such service as we are discussing here, it has been improved upon. The grease gun—hand operated—succeeded it with increased efficiency and a considerable saving in the time required to do the job. But, the grease gun was not the final word in conveyor belt lubrication. It has been succeeded by an improvement on itself—the grease manifold. This method of lubricating the bearings of belt conveyors has resulted in a reduction of labor cost to a degree, regardless of other economical and advantageous features, hardly believable.

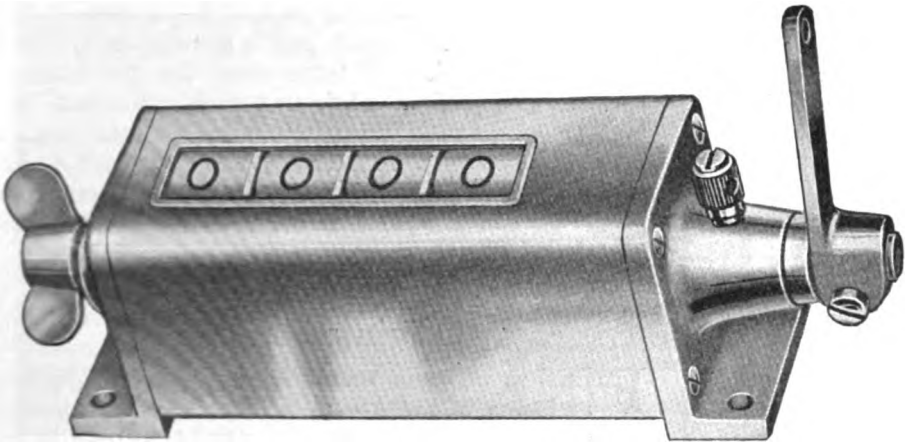
Through the use of this system it is estimated that the time required for attention to conveyor belt lubrication is one three-thousandth to one one-thousandth as frequent as is necessary where these conveyors are lubricated with grease cups. Reducing this to a dollars and cents basis, the result is of very large proportions in the element of economical maintenance. It constitutes a subject in mechanical operation worthy of minute investigation and consideration wherever belt conveyors constitute an important element of equipment, responsible for the maintenance of continuance of production. Following is a practical example of the economies effected by the manifold system of lubrication:

A conveyor belt 1,200 ft. long is equipped with approximately 500 grease cups on each side of the belt—total 1,000 grease cups—1,000 points or places requiring personal attention by oilers, and grease cups requiring filling usually three times weekly—3,000 fillings weekly, or 12,000 fillings monthly.

A conveyor belt 1,200 ft. long will require, with the manifold system, six grease stations located 200 ft apart, header pipes extending for a distance of 100 ft on each side of grease stations lubricating connections therefrom to all bearings within the lineal distance of the 200 ft. The oiler is not required to apply grease directly to any one of the bearings within the 200 ft., the agency of application being solely and entirely through the influence of the grease station. Each grease station has power capacity of delivering grease to 160 to 170 bearings approximately (inclusive of bearings on both sides of conveyor) and lubricating the outside and intermediate rollers. One grease station for 200 ft., 6 for distance of 1,200 ft.; these grease stations will constitute the full lubrication installation. Grease stations will not require recharging more frequently than semi-monthly or twice monthly—therefore 12 applications monthly.

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Veeder

Set-Back Counter

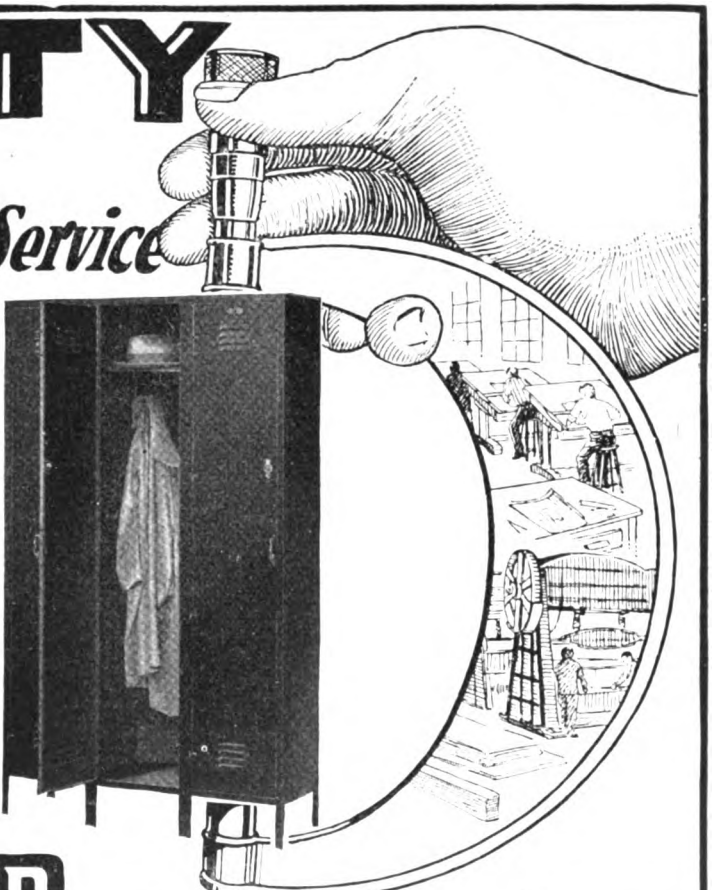
Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

Watch the drive to lower *costs*—to lower prices and sales-resistance. *Plan the drive* at your own machines, so your workmen can turn out a right-priced product in competition with the product of other workers. Favor your men with Veeder Counters to watch their output, register *gains* and better assure their wages. They'll find it just a natural urge to beat their own best records on *"VEEDERS." Booklet?*

THE VEEDER MFG. CO., 31 Sargeant Street HARTFORD, CONN.

QUALITY

the measure of Longer Service



In every quality product there are unseen parts that constitute its value. In a quality locker the unseen values are also present. Unfailing service over a long period of years requires more than careful selection of material. It requires correctly applied engineering knowledge.

The supremacy of Durand Lockers is the successful application of engineering knowledge. Doors are 16 gauge steel, frames are one piece, and hinges are noted for strength and simplicity. Other parts are built to certain high standards adopted by Durand—built in relation to each other, resulting in maximum strength, security and neat appearance at a reasonable cost.

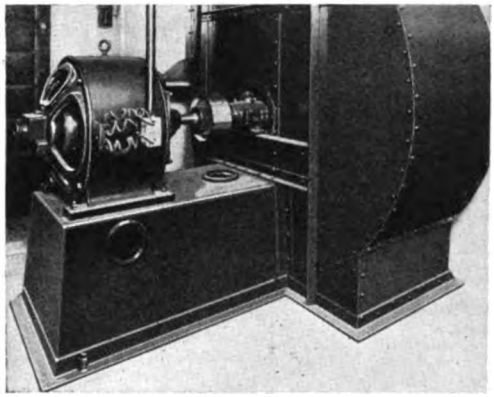
Freedom from projecting parts inside and out, the ease with which they are kept clean, and lasting finish are visible indications of the deeper "built in" principles of Durand Lockers.

Time is the test of quality. Each added year of life will find Durand Lockers giving the same satisfactory service as the first year. Durand Locker satisfaction does not depreciate with age.

DURAND STEEL LOCKER CO. INC.
1539 First National Bank Bldg., Chicago, Ill.

Write for our informative locker booklet No. 21. We will gladly mail it without charge or obligation.

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Diehl Motor Driving Large Ventilating Blower in Boston Bank

DIEHL MOTORS

The view above shows one of a group of Diehl motors used in large Boston, Mass., bank to drive ventilating blowers. The Diehl motors assure this bank a constant supply of clean fresh air.

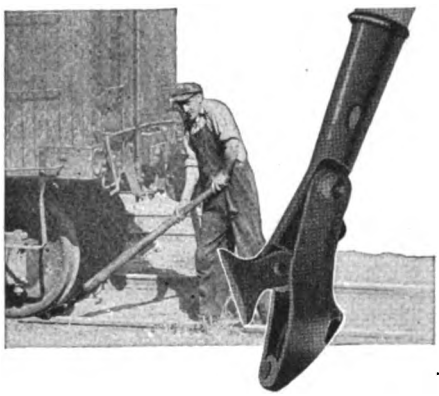
Diehl motors, because of their sturdy construction and high electrical efficiency, are the ideal motors for operating not only blowers but all kinds of general and special machinery. Let Diehl engineers help you with your motor problems.

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New Badger

SLIP PROOF CAR [illegible]RS

the ratio of 12, to 12,000 or 1 to 1,000 points of contact.

From the foregoing it is obvious that certain definite reductions in overhead costs can be accomplished. These include a reduction in labor costs for the attention formerly required in lubricating each individual bearing; an economy in the consumption of lubricant; an increase in service of bearings and journals; and, a decrease in the general depreciation of equipment which must result in a decided elevation of general increased mechanical efficiency.

Origin of the File

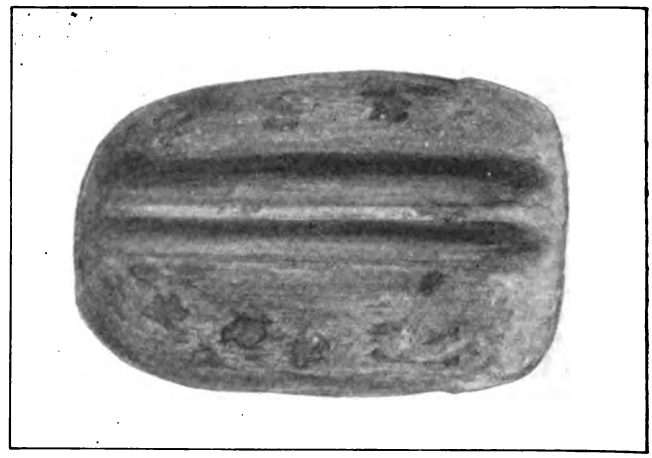
FILES as we know them today had their beginnings, undoubtedly, in the rough stones and crude abrasives that primitive man found ready at hand for use in rubbing down the shafts of his arrows and spears and the handles of his tools. These ground off the surface, instead of cutting it as do the files and rasps of today.

"Iron sharpeneth iron; so a man sharpeneth the countenance of his friend," Solomon wrote in what probably is the first reference to the file in history.

A more definite mention of the file is found in I Samuel, 13:21, which is supposed to relate to about the year 1093 B. C. This reads: "They had a file for the mattocks, and for the coulters, and for the forks and for the axes, and to sharpen the goads."

Homer also speaks of files in the Odyssey and alludes to their use in metal working.

In the time of Alexander the Great, about the year 300 B. C., Daimachus, a Greek writer, enumerates four kinds of steel and describes their uses. From one kind, he says, were made files, augers, chisels and implements for cutting stone.



Back of these earliest written records, which have been collated by Henry Disston & Sons, Inc., of Philadelphia, manufacturers of saws, files, tools, and steel, the history of the file is gleaned from the relics of prehistoric man that have been found in Egypt and Crete, in the debris from the lake dwellings of Switzerland, and in the ancient pueblos and mounds of our own continent. Some of these ancient types of files, and a stone apparently used as an abrasive are shown in the accompanying illustrations.

Nature undoubtedly produced the first true cutting files and rasps and provided certain molluscs with rough tongues for filing or boring through the shells of other molluscs that they feed upon. The wasp has a rasp-like

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~and they don't even mention oil!

"It really is remarkable to look back and consider the many, many thousands of washing machines we have equipped with Arguto Bearings throughout and the complete absence of any complaint on these bearings."

"The writer has used your bearings in a great many places where nothing else would stand up, much less last. I do not need to be told of their merit."

"We have had the very best success with your 'Arguto' Oilless Bearings. We are very fussy about dirt and where grease is likely to come in contact with our product we have substituted your bearings in place of the type that has to be oiled."



"I called on one of my customers a few days ago and he showed me a Pulley which I bushed with Arguto in 1912, and this bushing was still in good shape showing hardly perceptible wear. It is a loose pulley on a high speed wood working machine."

"We believe that we have some of the most unusual conditions in the country to which bearings are subjected due to the powdered Carborundum and powdered glass which we use as a lapping compound. These grinding compounds have proven most destructive to our bearings, previous to the use of Arguto."

"These loose pulleys were formally babbitted but last only a short time. We have two Arguto Bushings in A-1 condition that were put in September 1910."

"The Arguto Bushings with which the National Acme Automatic Screw Machines are equipped have been running in our factory for TWENTY YEARS—with no sign of wear."

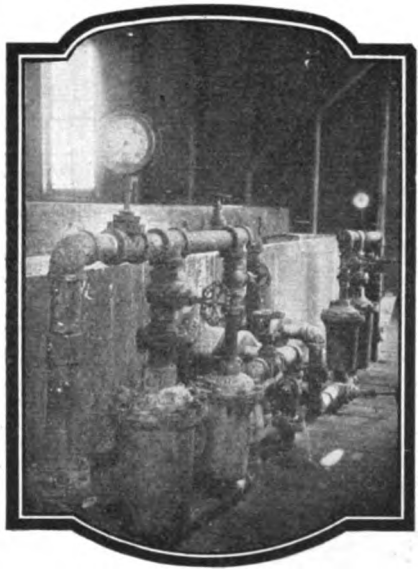
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If you don't know the Armstrong, you should. To convince you of its superiority we will send you a trap for a 90-day trial. We'll send it prepaid and you can return it collect. ***Use the coupon!***

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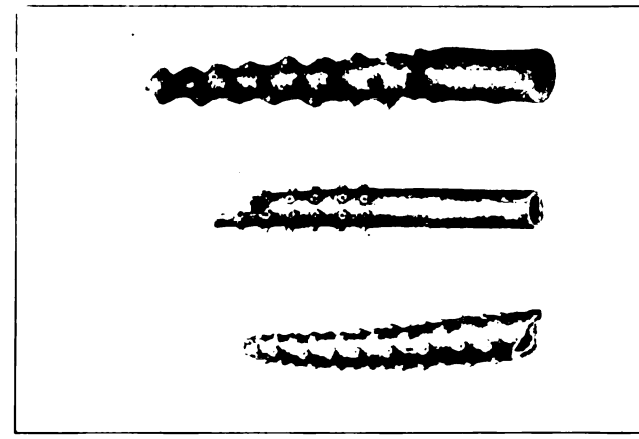
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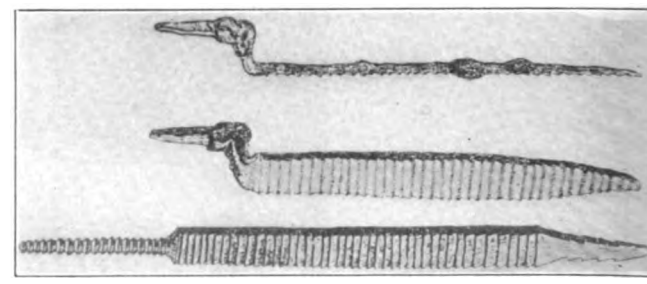
Mail to Armstrong Machine Works
326 Maple Street, Three Rivers Michigan

II 1-Gray

organ with which it abrades dry wood, afterward mixing the dust with a glutinous saliva for forming the paper to build its nests. The tongues of cows and cats are familiar examples of true abrading instruments in the animal kingdom.



Specimens of prehistoric stone scrapers are found in many museums. They are virtually the same as similar instruments of stone used in recent times by savage tribes. After the Stone Age, from which these scrapers date, came the Age of Bronze. Several specimens of ancient bronze files exist. One of these, believed to be about 3,500 years old, was dug up in Crete by an expedition from the University of Pennsylvania and is now in the museum at Candia, Crete. It has a rounded back and a flat surface for rubbing, bearing an astonishing resemblance to the half-round file of today. It is 3⅝ inches long, ⅜ of an inch wide, and ¼ of an inch thick.



In Egypt there have been found some very peculiar bronze rasps, 1½ to 2½ inches long and apparently made from sheet bronze coiled into a tapering cylinder. Holes were punched in the bronze before it was coiled, so that in the finished rasp the rough edges of the holes project from the surface. These rasps probably had wooden handles and are believed to have been used by jewelers.

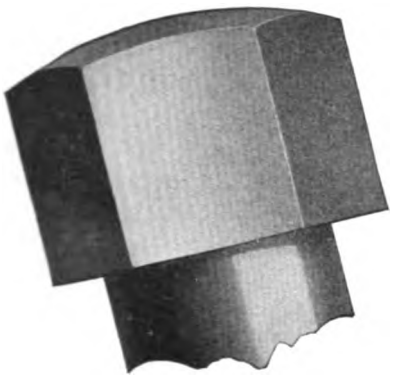
One of the earliest examples of iron files was found on the site of Swiss lake dwellings and dates from the times when Europe was the home of barbarous tribes. This file has coarse toothing running across the blade at right angles and has a well developed tang, much like that of modern files.

Another ancient iron file formed part of a collection of armorers' tools left at Thebes in Egypt by Assyrian invaders, as is shown by the presence of a copper helmet of the Assyrian style which was found with the tools.

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A Perfect Hexagon Head



"If it's upset— it must be heat-treated"

Each face clean cut, smooth and true. Made by the Ferry Patented Die Compression Principle—

That's a distinguishing feature of Ferry Cap Screws.

Be sure you specify Ferry Heat-Treated, Bright - Finished Cap Screws. They will eliminate trouble and will save you money.

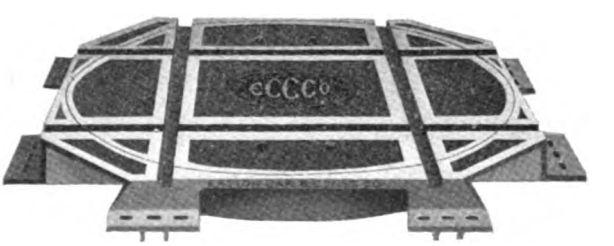
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Tool users know there's nothing namby-pamby about a Prentiss. It's a regular man-made, man-satisfying vise that they never hesitate to shove on to a real job. It's built for work. Men will tell you so. They'll tell you about the castellated collar fastening, too, which is some improvement and what a "son-uva-gun" of a grip a Prentiss Vise gives 'em.

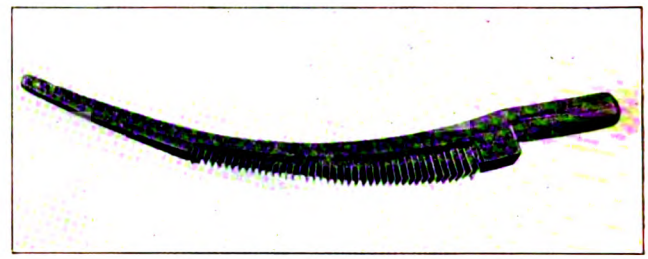
And those are only two of the Prentiss features men are mighty keen about. From the vise base to the jaw faces, shop men are all for the Prentiss. Their own words prove it—"it's a dandy."

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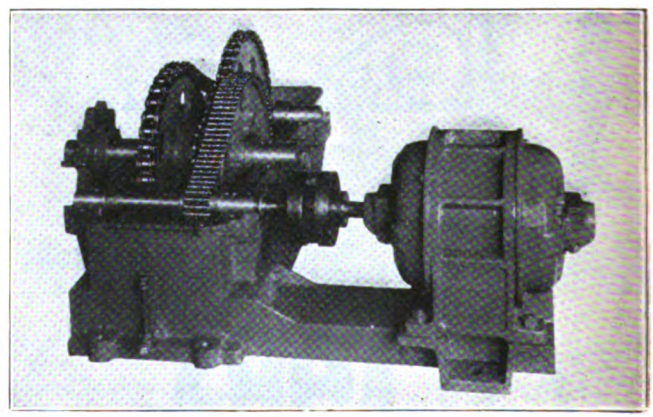
This file is believed to date from about the seventh century B. C.

With the use of iron it became possible, for the first time, to produce really efficient files for cutting metal, but iron is so perishable that few examples of these early iron files have survived the ravages of rust. Roman files have been found on the sites of their camps in England and half-round files of an unknown period have been dug up in London. Gradually, as metal working developed, the file was perfected and became a commonly used tool.



Roller Chain Drive Used in Speed Reducer Design

A NEW and interesting application of high speed roller chain is shown in the accompanying illustration of a speed reducer. On the main drive triple-strand chain is used and single-strand on the two reduction drives. As with gear reducers, the entire mechanism is enclosed and the chains and sprockets run in oil. This speed reducer made by the Washington Machinery Depot of Tacoma, Wash., is unusually accessible, the use of roller chain permitting the transmission of power in same direction without use of idlers. The particular advantage of this type of design is that the transmission efficiency and silent operation is preserved because of the inherent characteristic of roller chain in automatically absorbing wear on sprocket or chain through the mounting of the chain on the machine cut steel sprockets. The roller chain used is made by the Diamond Chain & Mfg. Co., of Indianapolis.



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More Than ⅓—

It is safe to assume that more than one-third of all manufactured products are made in part, if not entirely, of metal. And if these metal surfaces are not protected, high overhead and expensive plant upkeep is the result.

To save money, to eliminate this waste—many industrial concerns are recommending VALDURA ASPHALT PAINT. This unusual preservative is absolutely waterproof; also acid and alkali resisting. It is made from 99.5% pure Gilsonite *Natural* Asphalt, genuine linseed oil and other high grade ingredients—the best obtainable.

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No need, because you can get more *effective* results in cleaning—turn out FASTER, BETTER WORK AT LOWER COST with Oakite Materials and Methods.

With Oakite, cleaning operations are standardized. Unnecessary work is eliminated. The output of an Oakite cleaning department is definitely determined because it is consistently *thorough* and can be depended upon with confidence.

Right now, at the beginning of the year, ask to have one of our service men call; or write for booklets bearing on your work.

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Industrial Cleaning Materials and Methods

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Fostering Good Employee Relationship

By Sanford DeHart

SEVERAL years ago a very successful industrial manager, who was then employing more than five thousand workers, gave me some sage advice which I have never forgotten, it was this: "never permit a worker to leave our employ, whether he leaves of his own volition or not, with a bad taste in his mouth."

Voluminous literature has been produced since that time describing the methods pursued in attracting and hiring workers, but unfortunately there has been a dearth of material outlining the principles employed in tactfully handling the worker who is severing his connection with the company, so that he leaves with a good word for the company.

There is a curious psychological side to this question that becomes at once apparent when you give it a moment's consideration; in fact, there are two unfavorable psychological aspects to this question. One is the worker who has become disgruntled and is severing his connection with the company, and whose services we may need badly sometime, and the other is the man he meets or chums with on the outside has received a bad impression of the company, and may also be just the worker that may be needed some day when orders are coming in faster than workers are to be found. Talk about your endless chain; this has them all beat when it comes to speaking a good word for the company, and conversely when it comes to speaking a derogatory word for the company.

This is well illustrated by the experience I had recently while riding in a bus, when I inadvertently heard two occupants, one of whom I knew slightly, "panning" a well known local concern.

It seems from what I could gather one of these men who was doing the talking had at one time been employed by the concern that was getting the "panning," and he was advising his companion not to apply to that concern for employment, as he would probably get just as rough a deal as the informant.

I happen to know something about this concern, and I also know if this young man had been properly handled when he left he would not feel so bitter toward it. This company has a reputation for treating its employees fair and square, but somebody slipped a cog in this particular case. I am cognizant of the fact that occasionally one will encounter an employee who is a natural malcontent, but this did not seem to be the trouble with the case I am citing.

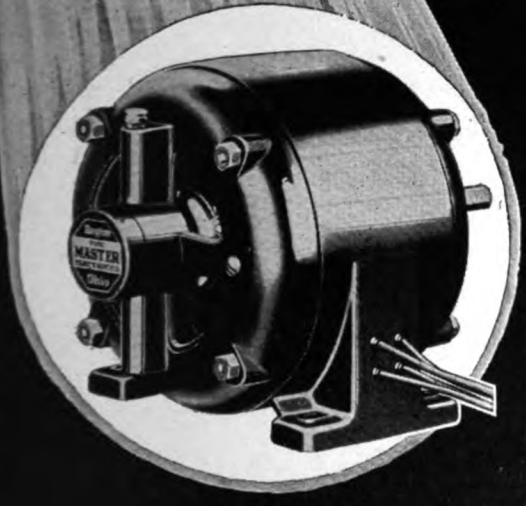
The present writer was at one time employed by a large automobile company, which was obliged to hire from fifty to seventy-five men a day for replacement.

Somehow or other this did not look good to the manager of this company, so he got busy to ascertain the cause of such a large labor turnover. After considerable investigating he organized a labor committee whose duty it was to interview every man severing his connection with the company, and listen attentively to every grievance real or imaginary. This committee functioned

(Continued on page 84)

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Performance *that bears the* Spotlight



MASTER GUARANTEED MOTORS bear the spotlight of rigid comparisons because of their reliable *performance*—the only true test of motor value. You will find them upon high grade appliances and machines because:

(1) They last longer—this is insured by their cool operation, oversize bearings, good insulation and simplicity of construction.

(2) They have large starting and overload capacity—an ample reserve for service emergencies.

(3) They start and operate rated load on voltages below normal—*as low as 70% in many cases.*

(4) They will operate for long periods without attention due to improved bearing construction and lubrication.

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Dayton THE MASTER ELECTRIC CO. Ohio

Less than 40°

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6-FAMOUS GENERALS



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Hannibal



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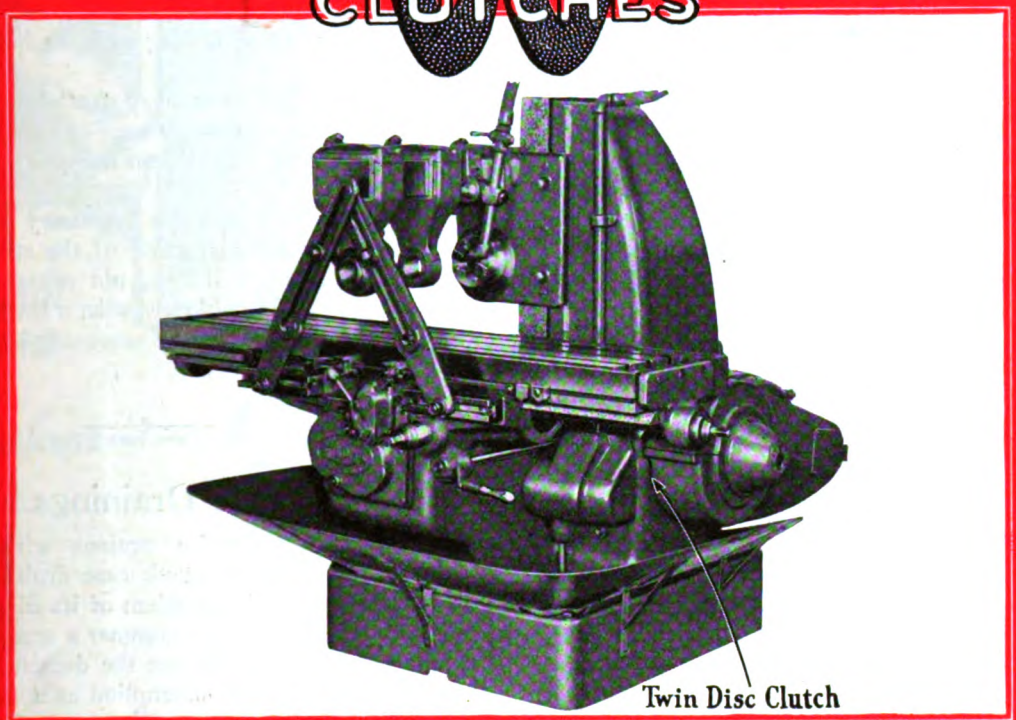
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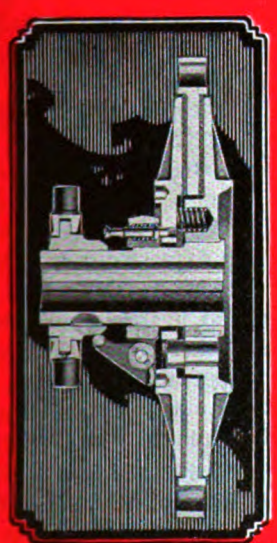
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Every part is made of the best material for the purpose, machined accurately to S A E tolerance limits.

All parts are closely inspected and must conform exactly to rigid standards before and after assembly.

The clutch is carefully engineered into its place, and given adequate reserves, both of work and safety factors.

Thus, Twin Disc Clutches meet the requirements of large and small machine tools and, because of quantity production, can be sold at highly attractive prices. Write the Engineering Department.

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Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie St.
Cleveland—James R. Howell, 6715 Quimby Ave.
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TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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(Continued from page 80)

so well that in less than six months the labor turnover was reduced more than fifty per cent.

In this plant when the necessity arose for discharging an employee he was tried out in at least three different departments before his name was definitely removed from the payroll. But no matter whether he was discharged or left of his own volition it was seen to that he left with a good feeling for the company. This does not mean that every man that severed his connection with the company was given a banquet, but every man left with about the same feeling as if he had been tendered one.

This system has so many potentialities for good, that I believe if more companies were to adopt these measures it would do much to cut down the type of worker known as "floater."

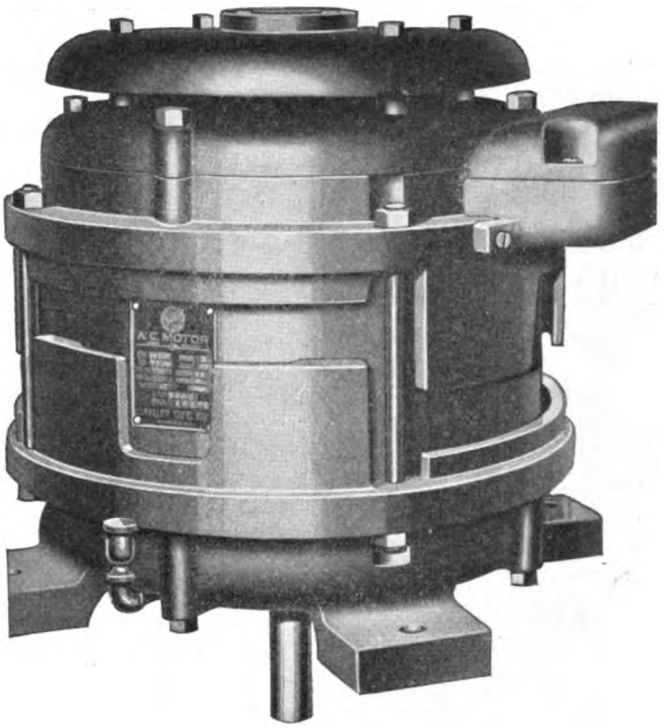
Even though it becomes necessary to discharge an employee for some infraction of the rules of the plant, or for incompetence it does not necessarily imply that he is hopeless. We all know what a little seasoning does for ball players, and a little seasoning has done wonders for many workers.

Crank Case Drainings for Fuel

A CHAIN of service stations with an increasing accumulation of crank case drainings from automobiles presented the problem of its disposal. Throughout the spring and early summer a considerable amount could be used on roads but the demand was not heavy and only seasonal. Consumption as a fuel seemed to be the only outlet but many obstacles had to be overcome. After considerable experimenting a plan was evolved whereby this refuse oil could be successfully burned, netting an annual saving of approximately $3,000 for coal.

When the oil is received at the plant it is introduced into a concrete pit serving as a settling basin. A piston-type hand pump operated by electric motor forces it into an overhead supply tank in the coal bin. Here the oil is warmed with a steam coil and passes through a 1½ in. pipe line leading to a strainer entering into a small coil type heater before reaching the burner. At the point of consumption it reaches a temperature of 100 degrees Fahrenheit where it is easily atomized.

The burner can either be operated by air or steam. The former is used until steam is formed. Preheated steam obtained by running steam lines back and forth in the fire box proper and covering them with fire brick considerably reduces the consumption of oil which averages seven to eight gallons an hour. A stack safety control is the last word in efficient operation.



Vertical Motors for special service

YOU can get the Valley Ball Bearing Polyphase Motor in a vertical frame for special service.

And like all Valley Motors it will give you special service, too.

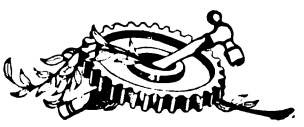
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Get a "C-M" Idea!

IF the transportation of material in your plant is left to the physical ability of men to lift and carry, your costs are higher than they need be.

In the plant illustrated in the view above, *ONE* man with a "C-M" Electric Hoist and Traveling Crane moves more material with less effort than *FOUR or MORE* men could possibly do by physical effort.

Moving should not be 90% of Making!

Results

ONE MAN doing the work of FOUR or MORE, thereby releasing three or more men for other work! Faster handling of material; Rock bottom handling costs; And valuable floor space saved because of the ability of the "C-M" equipment to stack material higher than could be done by the combined strength of a gang of men.

Put "C-M" Ideas to work in your plant!

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Clipper Knows

The Clipper Belt Lacer — standard of the world. More than 225,000 now in use.



The above Diploma of Award indicates that even in far off New Zealand the value of Clipper Belt Fasteners is recognized, in this case by the awarding of the First Order of Merit. The Clipper Belt Lacer Company is justifiably proud of this award and accepts it as a sign that Clipper Fasteners are rapidly becoming standard throughout the world.

QUALITY Clipper BELT LACING

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No Boundaries!

IT is not surprising that the Gold Medal Award of the New Zealand and South Seas Exhibition has been awarded to the Clipper Belt Lacer Company. The widespread acceptance of *Clipper Belt Fasteners* as standard belt connections, not only in North and South America but in Europe and Asia, should have a noticeable effect upon the decisions of practically all foreign countries.

Since one-third of the enormous daily production of *4,000,000 Clipper Belt Hooks* is exported to foreign lands it is evident that *Clipper* enjoys an international reputation.

WHY CLIPPER PRODUCTS ARE SO WIDELY USED

Clipper products are sold at a low margin of profit and at prices that meet foreign competition even in foreign countries.

Clipper Hooks are mechanically perfect and are made of the best fatigue-resisting steel.

Clipper Pins are the best we know how to make.

Clipper Hooks have a staggered double grip.

Clipper Belt Lacers are the most efficient lacers for use with *Clipper Hooks*. Material and workmanship fully guaranteed.

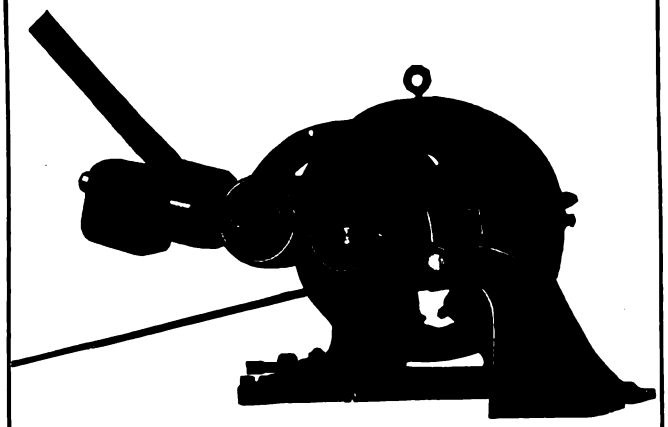
Standardize on Clipper Products

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN



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Proved Results Instead of Experiment



WOOD'S SHORT CENTER BELT DRIVE

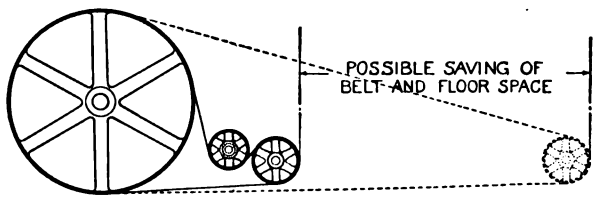
When you buy a Wood's Power Transmission Appliance you are not buying an experiment but a proved result of long lasting economy—a result that carries with it the experience of 70 years in solving power transmission problems.

For example, the Wood's Short Center Belt Contactor is a power transmission machine with distinct money saving, power saving, appeal. Saves belts, saves power, saves floor space. The increased arc of contact illustrated below shows how you get full power transmission with this Short Center Belt Drive—and that means big power and belt savings over the old method.

Wood's Short Center Belt Contactor is successfully and economically serving many and varied industrial plants throughout the United States. It will in your plant, too.

There's a Wood's Dealer near you who can quickly and efficiently supply your power transmission needs. Get acquainted with him. He's a worthwhile man in your community and he's reliable.

Just ask him how you can effect savings with this present day power transmission need. He'll be glad to tell you—and prove it—without obligation on your part.



T. B. Wood Sons Co.
Chambersburg, Pa.

NEW ENGLAND BRANCH:
Cambridge, Mass.
Makers of Power Tr

SOUTHERN BRANCH:
Greenville, S.C.
hinery Since 1857

What Does the Arc of Belt Contact Really Signify?

THE surprising effect of large arcs of belt contact on pulleys is convincingly demonstrated by means of the simple apparatus illustrated in Fig. 1.

The apparatus consists of a stand "A," mounted on a base. The shaft "C," free to revolve on ball bearings mounted in the stand, is fitted at one end with a cast iron

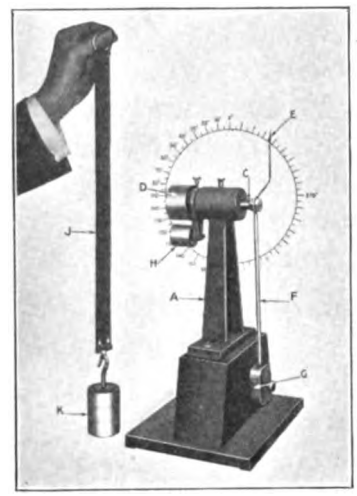


Fig. 1. The simple apparatus for showing the effect on gripping power of a belt's arc of contact on the driving pulleys.

pulley "D," and at the other end with a pointer "E," and a rod "F," to which is attached a weight "G." The belt wrapper "H" and its arm is mounted in a fixed position to a sleeve of the stand "A." The belt "J," the weight "K" and a circular scale constitutes the remainder of the apparatus. In Figs. 2 and 3 are shown belt applications with 180° and 250° arc of belt contact respectively.

In Fig. 2 is shown the equivalent of an ordinary open belt drive with 180° arc of belt contact. Constant initial

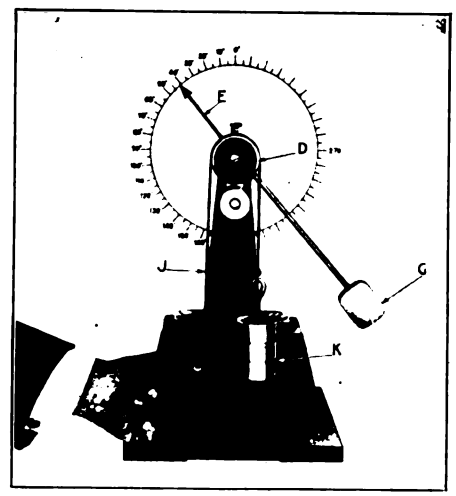


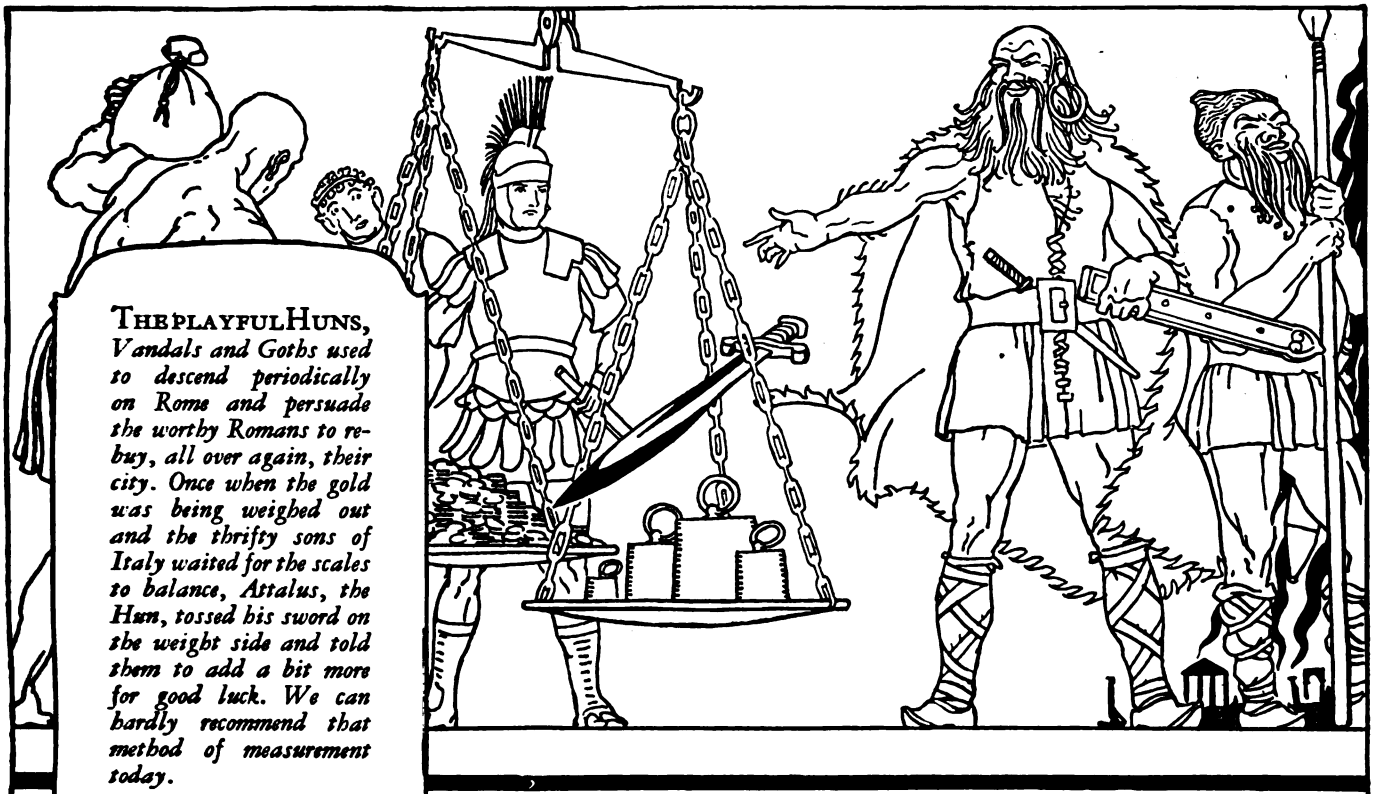
Fig. 2. With 180 degrees arc of contact belt slippage begins with the instrument pointer deflected only 40 degrees.

tension is established by the counterweight "K" and the maximum torque the belt will transmit under these circumstances is found by forcing the belt ring down with the thumb until the weight has deflected to a point where the belt begins to slip. This point is found to be equivalent to a 40° deflection on the scale.

In Fig. 3 is shown the equivalent of a flexible idler system with 250° arc of belt contact. With this arrangement the belt is passed around the idler pulley so as to establish a 250° arc of belt contact. The initial tension

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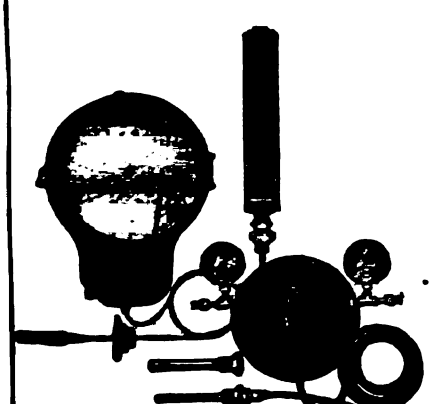
THE PLAYFUL HUNS, *Vandals and Goths used to descend periodically on Rome and persuade the worthy Romans to re-buy, all over again, their city. Once when the gold was being weighed out and the thrifty sons of Italy waited for the scales to balance, Attalus, the Hun, tossed his sword on the weight side and told them to add a bit more for good luck. We can hardly recommend that method of measurement today.*

Any instrument that gives man a standard of measurement must be DEPENDABLE

The fabric of national and business life today is trust—whenever that trust is betrayed we have wars, strikes and revolutions.

Accuracy and honesty enter even more vitally into the complicated balance of physical health and the intricate process of modern manufacture; a few degrees difference in temperature are the difference between human life and death; and in industry the difference between successful manufacture and ruin.

The manufacture of instruments which record and control so important a thing as temperature must be like Caesar's wife. The fact that today most of the scientific instruments made in this country for such purposes are made by *Tycos* is an indication of the reputation earned by this company over a period of seventy years. It is a guarantee to the dealer handling *Tycos* products. It is an even more important guarantee to the user of *Tycos* Instruments. It is the guarantee of dependability.



Taylor Instrument Companies

ROCHESTER, N. Y., U. S. A.

CANADIAN PLANT
TYCOS BUILDING, TORONTO

MANUFACTURING DISTRIBUTORS IN GREAT BRITAIN, SHORT & MASON, LTD., LONDON

REG. U.S. PAT. OFF. *Tycos* ROCHESTER, N.Y.

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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Your Fingers Are Safe



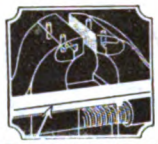
No, sir! The Parker Vise handle won't slip through and pinch fingers. Why? Because the exclusive feature of the spring and set screw (see cut) keeps the handle just where it is put. This means no lost time from avoidable accidents and satisfied workmen. It will pay you to use Parker Vises.

Write to W. R. B. for Catalog 57B

THE CHARLES PARKER COMPANY
Master Vise Makers, Meriden, Conn., U. S. A.

Other Exclusive Features of Parker Vises


Solid Underportion in Slide


Renewable Steel Jaws

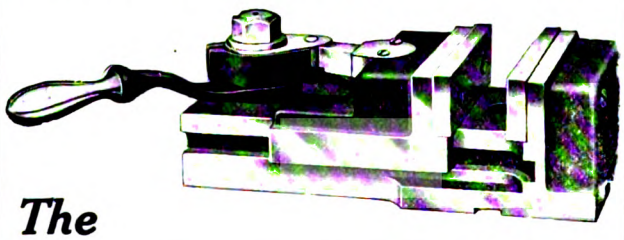

Swivel Base 360° Gripping Power


Handle Stays Put

PARKER VISES

GRIP LIKE A GRIZZLY

Wherever a Quantity Must be Quickly Handled



The
"PRONTO"
Quick Operating and Wide Opening Lever Vises

Made in Three Sizes

No. 1—6¼" long—8 lbs.....$50.00
No 1½—8⅛" long—17 lbs..$60.00
No. 2—9¾" long—33 lbs....$70.00

Prices Subject to a Discount of 45%

A slight movement of the lever and the jaws close with a grip of steel. This is just what you need where a great many pieces must be handled and handled quickly.

Designed for Milling and Drilling Machines

"PRONTO" Quick Operating and Wide Opening Lever Vises are made in the sizes shown. Write for descriptive circulars.

Manufactured by
EDW. PURVIS & SON
Successors to Carter & Hakes
110 YORK STREET BROOKLYN, N. Y.

is the same as in Fig. 2, because the weight "K" is unchanged. Again the belt ring is forced down with the thumb until the weight has deflected to a point where the belt begins to slip. This point is now found to be equivalent to a 90° deflection on the scale.

Because of the simplicity of the test apparatus, all doubt is satisfied as to the truth of the demonstration

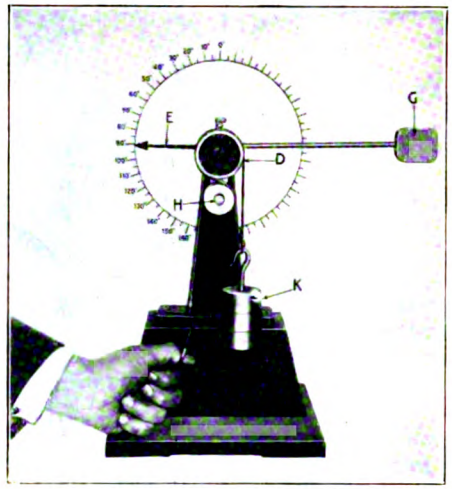


Fig. 3. Compare the pointer reflection here with that in Fig. 2 as showing the effect of a greater arc of contact on the driving pulley.

and the results obtained. There should be no question as to the fact that with a fixed initial tension "G," the increase in the arc of belt contact from 180° to 250° surprisingly increases the tractive or gripping power of the belt.

In addition to increasing the tractive or gripping power of the belt, the flexible idler system eliminates belt slippage; maintains automatically, constantly and accurately, the tension in the slack side of the belt; automatically compensates for changes in the length of the belt due to atmospheric or load conditions; permits of saving in floor space, building space and belting because of freedom in location of pulleys; saves bearing friction, lubrication and renewal of bearings because of reduced bearing pressures and permits use of high pulley ratios, ratios up to 1:15 being common.

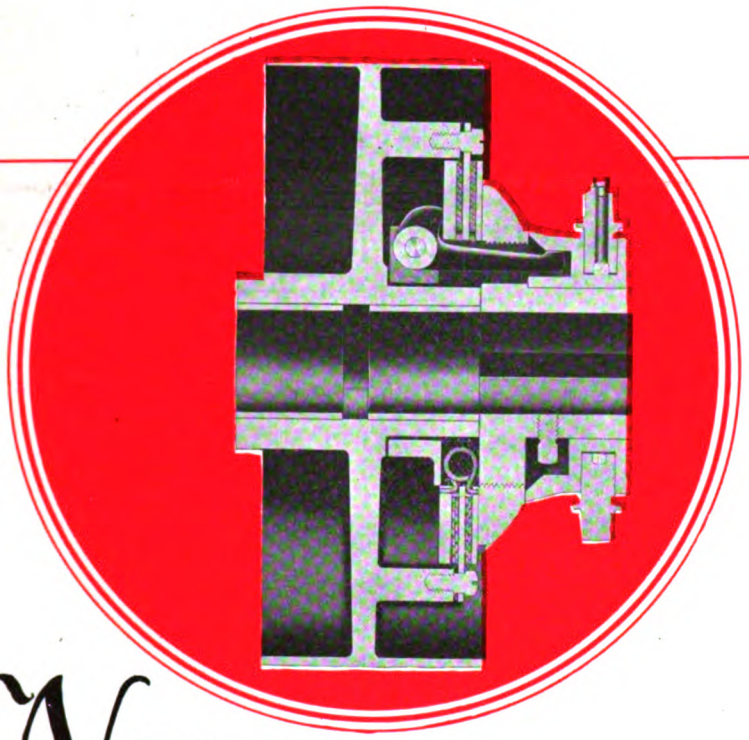
Is Smoke Invisible?

By W. F. Schaphorst

A GREAT many engineers who have smoke problems to contend with will be interested in knowing that the smoke problem of the city of Pittsburgh is still unsolved although the visibility of its smoke has been reduced as much as 80 per cent in recent years. That is, according to smoke charts, only about 20 per cent as much smoke can be seen as in the old days when Pittsburgh was considered the "Smokiest city in the United States." The present difficulty is this. Experts find that although there is apparently less smoke in the air, the amount of solid matter that goes up the chimney is greater than it was in the old days. The amount of solid matter was 85 tons per square mile per month in 1912, whereas now it is about 120 tons per square mile per month. It is believed that this is due to the installation of forced draft apparatus which blows more solids up the chimney but makes the smoke less visible. Ordinances will probably be passed specifying the amount of solid matter as well as the visibility. Thus the smoke question, too, becomes more complicated.

For complete information about anything advertised in this issue write Industry Illustrated

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and Now— THE CONWAY DISC CLUTCH

After many years of experimentation and tests, we have brought out the Conway Disc Clutch that carries out the Conway idea of less space for more power. The new Conway Disc Clutch has the following salient features:

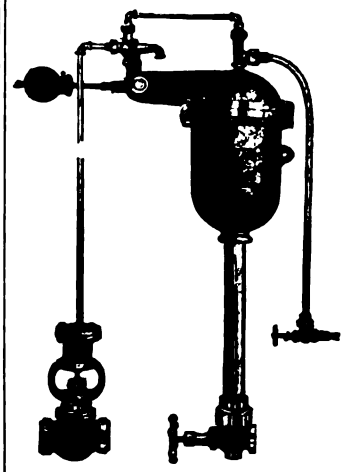
1. The clutch presents only a finished cylindrical contour.
2. There are no flying bolts, toggles, levers or pins.
3. The actuating parts are completely enclosed, yet the adjustment is handy and plentiful and clamps tight, being a simple split ring with a smooth finished surface.
4. The levers are alloy steel with a large factor of over strength. Their under slung position permits a large lever ratio which requires only slight pressure for engagement.
5. Centrifugal force would disengage the clutch when the cone is withdrawn, even if there were not springs forcing the plates apart. Vibration cannot cause the cone to withdraw, as this part is machined with a proper deflection angle.
6. A unique process of treating the key surfaces has practically eliminated wear in the splines.
7. The clutch is probably the quickest and easiest disassembled unit of its kind produced.
8. All discs are treated steel with woven asbestos lining, with ground faces as standard production.
9. The body of the clutch is counter bored to permit the pulley hub to extend under the point of frictional driving contact, which, also, saves considerable shaft space.
10. The clutch is inherently balanced.

We are ready to send descriptive matter and complete information.

THE CONWAY CLUTCH CO.
1960 RIVERSIDE CINCINNATI, OHIO

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INCREASED



Steam Production

is secured when a constant water level is maintained in boilers. To maintain this constant water level don't depend on careless hand feeding but install a

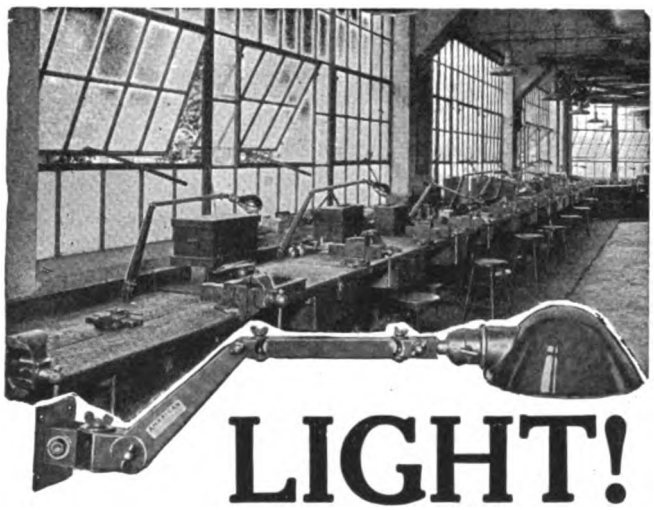
VIGILANT *FEED WATER* REGULATOR

Users will tell you the Vigilant will increase your steam production, decrease your fuel bill and relieve boiler strain.

Try a Vigilant—the watch dog of efficiency.

Catalogue on request

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave. Pittsburgh, Pa.



LIGHT!

where and when needed

Let us make a survey of your lighting needs—write today for booklets, or a representative's service, or both.

The economy of an American System as compared with a flood light system is found in the fact that the light is placed exactly where needed, and it is used only when needed.

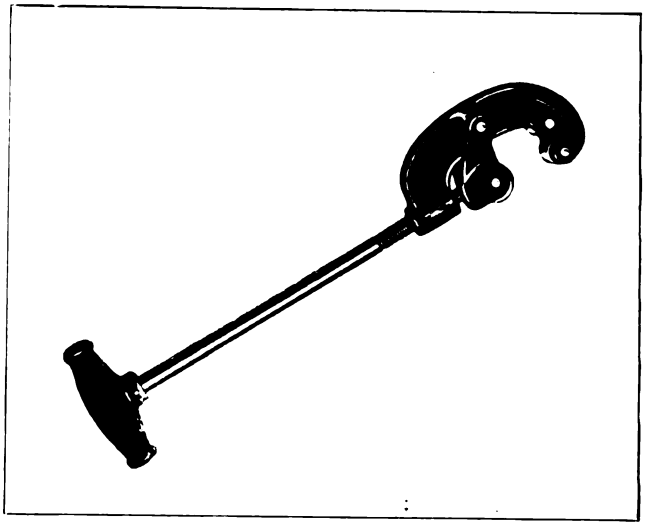
No flood lighting of great areas with the resultant shadows on the tools just where light is most needed—but light accurately placed which guarantees greater and better production.

American Fixture Company
230 West Water Street Milwaukee, Wis.

A New Pipe Cutter

THE Oster Manufacturing Co., of Cleveland, O., has recently brought out an improved Saunders-type pipe cutter that converts an otherwise costly hand job into an economical power operation.

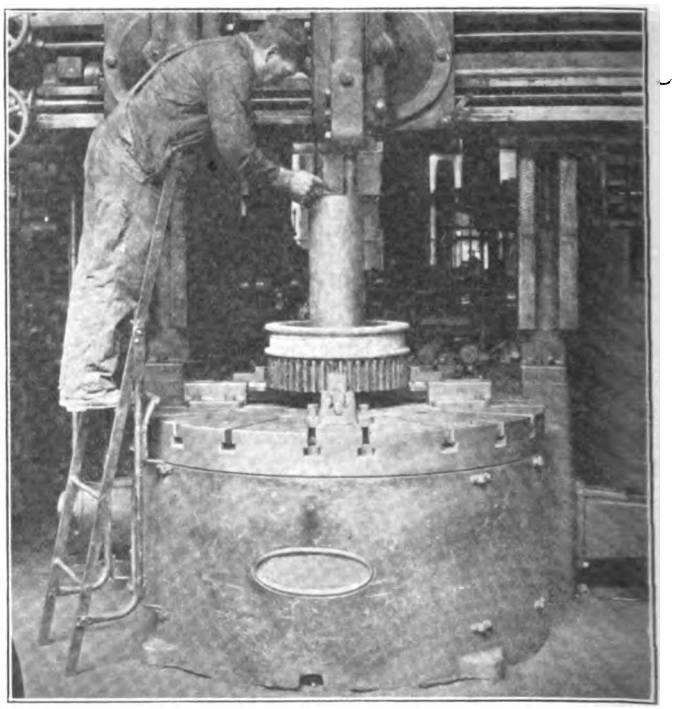
Designed primarily to meet the demand for a strong, sturdy tool that will "track" readily when turned by a mechanical drive such as the Oster power driven pipe threader, the new cutter is also applicable to hand use.



Increased cutting-off speed is secured by the deeper bite made possible by special reinforcement where the greatest strain occurs. The new cutter is made in two sizes, one of which covers ⅛ to 1-inch pipe and the other ½ to 2-inch pipe.

A Handy Portable Ladder

THIS portable ladder, for use with vertical boring mills, is in use at the Pittsfield, Mass., plant of the General Electric Company. The ladder raises the operator to the necessary height and gives him a firm



support. A toe guard, attached to the ladder, protects the operator's feet when the mill is running.

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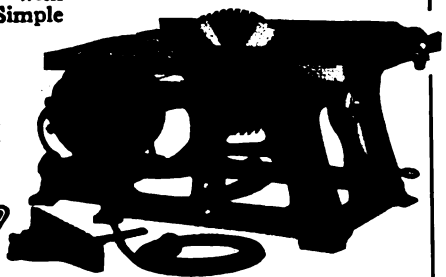
Expedite Production With These Machines



Many rush jobs can be handled with Heston & Anderson Portable wood working machines while your large machines remain on schedule work. H. & A. Bench machines are portable and convenient, yet have capacity for production work. Many plants are saving money by using them on regular production schedules. Low first cost and low up-keep make them highly economical.

Send us a description of your work and we will give you production figures.

Sturdily built with plenty of power. Simple in operation. Cost very little for current. Sold on a guarantee of satisfaction. Hundreds in use. Your dealer sells them.



Ask for our new catalog showing our complete line of Bench Woodworking Machines. It is free.

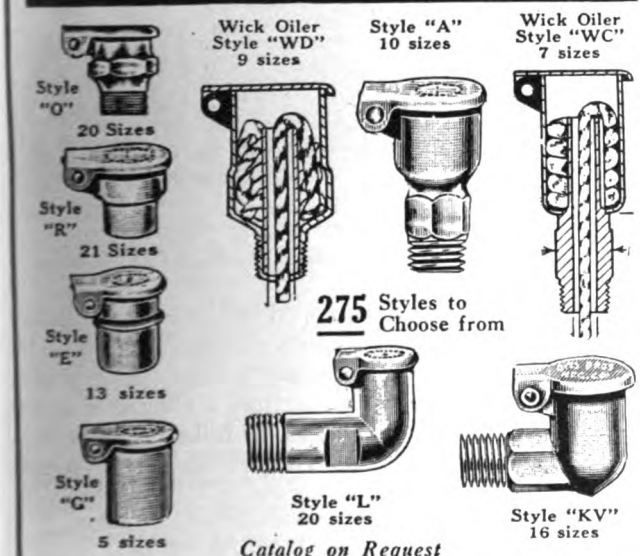
HESTON & ANDERSON

613 W. Depot St., Fairfield, Iowa

GITS BROS.

Standard of Comparison

BETTER OILERS



Catalog on Request

Gits Bros. Manufacturing Co.

1970 S. Kilbourne Avenue

Chicago, Ill.



LENOX WOLVES

They Rip and Slash and Tear Their Way Through the Toughest Job

Neither cattle, nor other live stock, were safe from the marauding bands of wolves that swept down from the mountain sides, over the lowland pastures on the Western Shores of Loch Lomond.

This was many centuries ago, during the time of the Earl of Lenox, and his sturdy, brave little clan MacFarlane. They feared no one, but these "Wolves of Lenox" with their strong, savage ruthless teeth that ripped and slashed and tore their way.

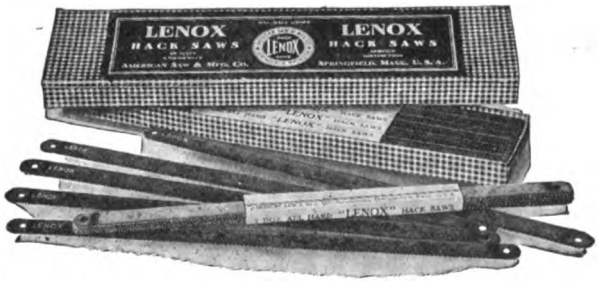
The teeth of the modern "Wolves of Lenox"—Lenox Hack Saw Blades—also rip and slash and tear their way. But, mill, shop and factory men approve of them because they help in doing better and more accurate work. Lenox Wolves cut through the toughest metal. They are noted for their sturdy strength, their uniformity of performance and precision.

Ask for Lenox Hack Saw Blades.

"The Tools in the Plaid Box."

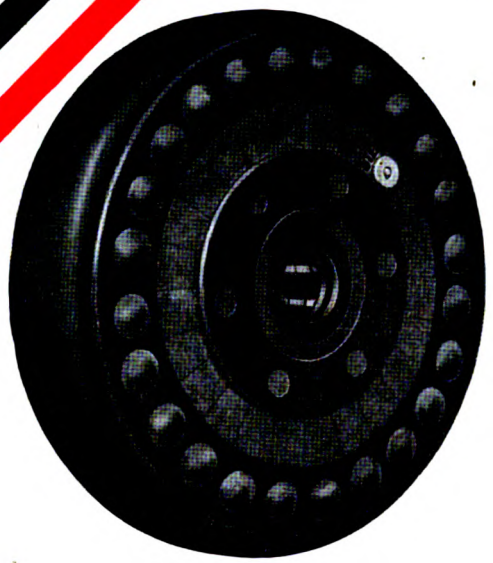
American Saw & Mfg. Co.,

Springfield, Mass.



"The Tools in the Plaid Box"

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"METZGAR"

Silent floor-saving
END-WOOD
TRUCK and CASTER
WHEELS



Heavy Duty
Hyatt Bearing

CUT YOUR TRUCKING OVERHEAD IN TWO



Regular Duty
Wood Bearing

Every user of "METZGAR WOOD WHEELS" acclaims them unbeatable! On Caster, Hand or Electric Lift Trucks, Warehouse, Platform Trucks and Trailers, "METZGAR WHEELS" reduce maintenance costs 50%. They are made in all sizes. They interchange with every other make of wheel. They are built like a butcher-block from carefully selected hardwood, scientifically treated. They cushion the load, handle easier and do not wear out of round. In fact, many leading truck users and manufacturers in all parts of the country depend entirely upon "METZGAR END-WOOD WHEELS."

Send for booklet, prices, discounts!

Metzgar Co. Inc.
459-503 Grandville Ave.
GRAND RAPIDS
MICHIGAN
U. S. A.

A New Development in Bookkeeping Machines

A NEW automatic bookkeeping machine that posts ledgers and proves its postings at the same time is the latest offering to the business world of the Burroughs Adding Machine Company, Detroit.

An accumulating register is the outstanding feature of the new machine. This register accumulates charges, credits or balances, depending upon the class of posting being done. As each item is posted to the ledger card, the correct proof figure—charge, credit or balance—is printed on a separate proof strip. These figures are accumulated throughout the run and can be subtotaled or totaled at any time.

In operation, this feature proves that each posting is made correctly. The figure on the proof strip must agree with the corresponding figure on the ledger card. If it does not, the error is at once apparent. It is confined to a particular item and can be corrected before proceeding if desired, with the result that endless checking is avoided. Then, at the end of a run, the depression of a single key prints a total of the items accumulated on the proof strip, thus establishing a positive proof for the entire run.



A New Burroughs Automomatic Bookkeeping Machine

The new machine is equipped with a full standard keyboard. All keys are visible; amounts set up on the keyboard may be checked visually before being written. The keyboard contains a date section, a character section for the identification of entries, a folio, amount keys, control keys, and a lever that controls the proof register or accumulator.



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"Red Shield" High Speed Drills

With 46 years' experience

we pronounce the "Red Shield" the best Drill yet produced

Should be used in every progressive shop where "cost reduction" is the slogan.

The "Red Shield" is imprinted on each Drill.

THE STANDARD TOOL CO.

CLEVELAND

New York: 94 Reade St. Chicago: 552 W. Washington Blvd.

Fredk. Pollard & Co., Ltd., London and Leicester, England Paris, France—Burton Fils Copenhagen, Denmark—Nienstaed & Co.

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street



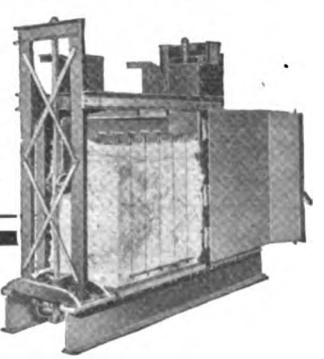
"The SAMSON of BALERS"

Power — Speed — Efficiency — Durability. These features distinguish the SCHICK baler wherever it performs. All baling operations are simplified by its use. In compression force particularly—as applied to paper, excelsior, rags, wood and metal scrap—the SCHICK baler excels. It is a veritable Samson of power.

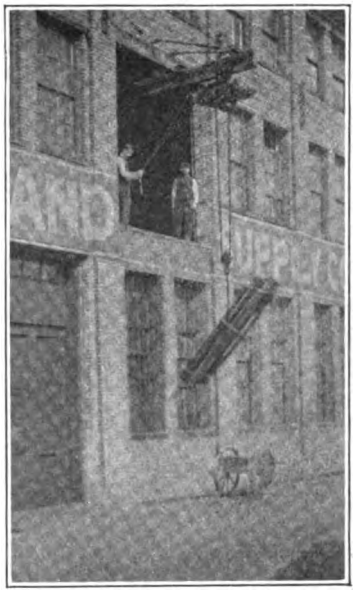
Schick Balers are all-steel and made in 8 sizes; Hand balers 125 to 375 lbs. capacity; Power balers 350 to 1500 lbs. capacity. Depend on a SCHICK for every baling need.

DAVENPORT MFG. COMPANY
Dept. R,
Davenport, Iowa

Send for descriptive Catalog and Price List. No obligation.



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For Quick Hoisting Use the ROEPER Electric Hoists

Made in a variety of types to meet most every requirement.

State your need and we will send you description and quote you prices.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
Traveling Cranes Electric Hoists Trolleys

The Common-Sense Chair

A rugged, low-cost, heavy-duty steel chair—correctly designed for comfort and durability—angle iron frame construction—Bessemer rungs—a comfortable wood seat—a snug back—a foot rest—no frills—no fancy work—just fifteen pounds of real chair built for lasting service—THAT IS THE MEECO 504A CHAIR.

The Endicott-Johnson Co. has 5500 MEECO Chairs, the United States Government has 4000, the Naumkeag Steam Cotton Co. has 1100, and more than 3000 other leading concerns are using them.

MEECO CHAIRS are priced for economy. It will pay you to investigate. Write today.



Fig. 504A

Heights 18, 20, 22, 24, 26, 28 and 30 inches

Mfg. Equipment & Engineering Co.
Framingham, Mass.

Since 1905—Largest Makers of Industrial Chairs and Stools

MEECO PRODUCTS



Eliminating Vibration in Generators

Felix J. Koch

AT COLUMBIA FORT, some few miles down the Ohio from Cincinnati, there has just been completed the last word in super-power generating stations; the plant costing upward of fifteen million dollars, and performing work regarded as equivalent to the strength of some nine million men.

The steam-turbines and turbo-generations which are, in last analysis, responsible for the production of this super-power are each the very first of their especial kinds.

Each turbine is divided into two parts: both these parts, however, are mounted on the same shaft, in tandem, with the generators near.

The first steam cylinder involved receives its steam at from 550 to 600 pounds pressure, and at the maximum temperature of 750 degrees. After this steam passes through the first, or high-pressure cylinder, it comes out at the reduced pressure of 120 pounds, and at a considerably lower temperature, of course. It is then piped back to the re-heat boiler, where it is again superheated to 750 degrees; but is not raised in pressure. After this it is returned to the steam turbine, and is used in the second, or low-pressure cylinder here. From this cylinder the steam passes into the condensor.

Each of the two turbines will generate 45,000 kilowatts, or 60,000 horsepower.

When both turbines are set in motion, the two units will have an energy equal to the total strength of three million men. On a twenty-four hour operating basis, the station would have a daily power output of approximately nine million workmen.

Naturally it would be expected that so tremendously powerful a piece of machinery as this must be would operate with a vibration or jar, very nearly all that attendants might stand!

Instead, so expert and then careful have been the engineering installations of the component units that, so far as human senses can detect, there is absolutely no vibration in the turbo-generator vicinity at all.

Perfections made in big turbines in the last five years have brought these to operate as easily and as smoothly as the finest automobile motor.

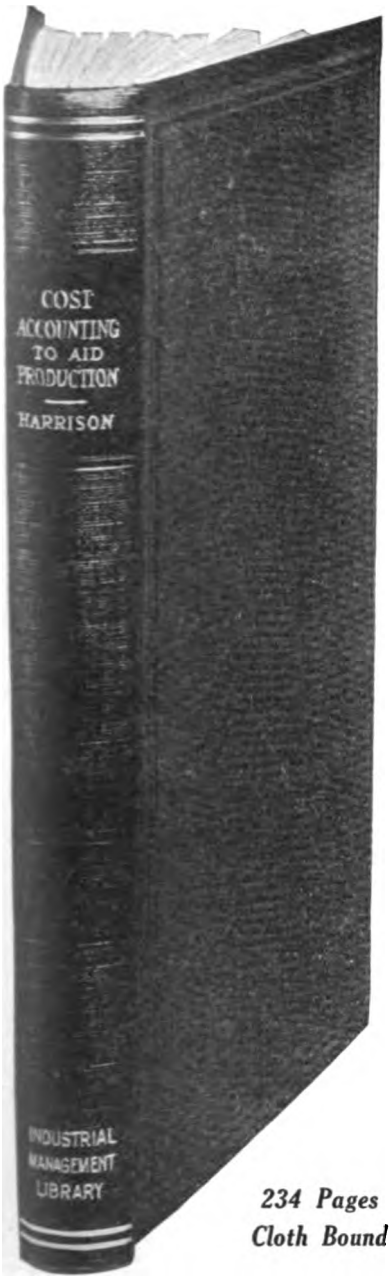
While professionals at power-plant operation are convinced of this fact very readily, lay visitors to the big station must be shown.

For their instant visualization of how absolutely free of vibration the turbo-generators are here, throughou public inspection days an American five-cent piece is set on its rim, on the top of one of the units, where no draf from doors, or windows, may blow down on it and dis turb the equilibrium here. The carefully-poised coin re mains exactly where placed until removed at the end o each operating day.



dvertised in this issue write Industry Illustrated

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234 Pages
Cloth Bound

Mr. Harrison has written his book out of his own accounting experience of some twenty years gained in widely different industries. The new methods of cost accounting which he describes, he himself has successfully applied in his own work. His whole book is based on the unquestionable fact that cost accounting should be an active part of the great process of production.

Can Your Cost Department *Completely Satisfy* These Essential Demands

1. Can it provide accurate costs of specific articles promptly? Can it tell what costs should be under present conditions? A cost system which does not provide for *predetermination* of costs cannot in any way be regarded as meeting requirements.
2. Can it provide manufacturing efficiency data by showing the cost of idleness, the efficiency of labor, variation in the cost of material, variations in expense resulting from handling power, miscellaneous stores and supplies, tool and machine costs, spoilt work?
3. Can it provide such information as the following as promptly as the occasion demands—goods manufactured, shipped today and to date, a summarized payroll by departments, a summarized machine report for each machine and class of machine, or any combination of these?
4. Can it provide reports for the executive in such form that he will get important data relative to the business with the minimum of time on his part? Will these reports enable the executive to see at a glance the abnormal or unfavorable conditions and their *causes?*
5. Can it provide selling efficiency data by showing the profits realized: by salesmen, on different lines, by territories, by different classes of customers, or any combination of these? Does it show the standards which should be realized?
6. Is it economical in cost as regards, first, the executive's time in extracting vital information from the data compiled; second, clerks; third, shop employees' time in making out detailed time distribution reports, etc.
7. Does it have standard practice instructions so employees can easily understand the routine involved and the relation of their work to the general scheme? Can the work be performed speedily, accurately, and mechanically?

How can cost accounting become a definite aid to production? How can cost standards be established and used to control costs in the making? How can cost accounting be made prospective instead of retrospective? How can its work be coordinated with the work of the planning and production departments? How can its methods be standardized so that its cost manager will instead of spending 95% of his time in supervising the routine work, spend this time in making use of the data compiled? How can it eliminate inefficiencies by disclosing their existence? The answers to these questions are of paramount importance to every executive. And you get them all authoritatively in

G. Charter Harrison's "Cost Accounting to Aid Production"

A Stimulating and Problem-Solving Book for Progressive Executives

Success in business is the result of exercising sound judgment based upon accurate knowledge of conditions, and if the executive is not furnished with reliable and adequate information relative to his cost of manufacture and distribution, he is in the predicament of the master of a ship without the means of determining his position. Generally speaking, the greatest handicap to efficient business operation is that of incomplete, inadequate, and inaccurate information relative to costs and profits. How to correct this condition, if it exists in your plant, is the purpose of Harrison's remarkable book. No man can read it without getting a new conception of the function of cost accounting and a better grasp on the means of solving its intricate problems. Examine the book ten days and see for yourself. Mail the coupon today and this remarkable volume will be sent to you postpaid at once. Its small cost—$5.00—is out of all proportion to its intrinsic value to you.

Examine it 10 days Free

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THE ENGINEERING MAGAZINE CO.
351 Fourth Ave., New York City

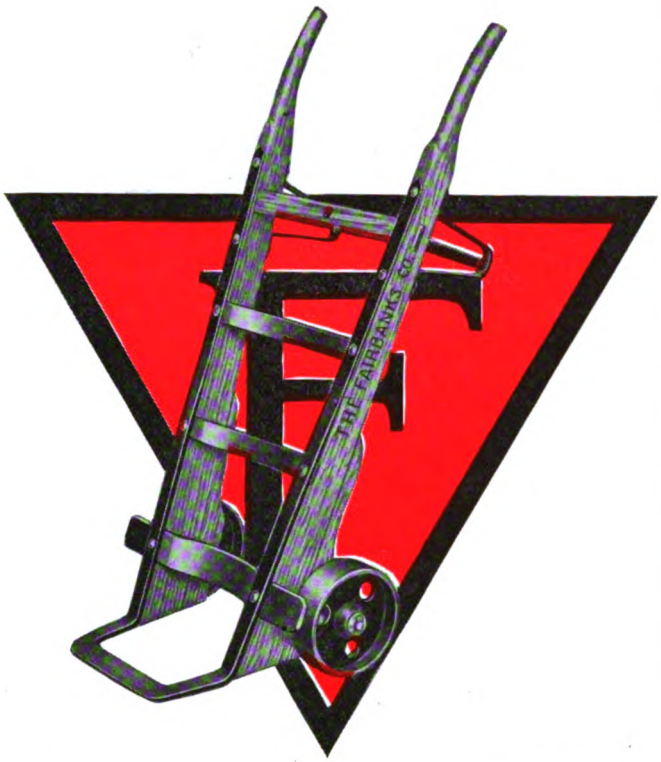
Please mail me a copy of "Cost Accounting to Aid Production" for 10 days' free examination. I will either return it in 10 days or mail check for $5.00 to cover.

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FAIRBANKS TRUCKS

Wood for Handling Ease Steel-Bound for Protection

Many departments of your plant find hand trucks indispensable units for dozens of handling jobs.

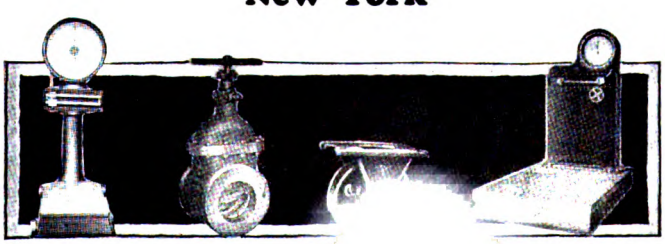
Choose these trucks with the same care and thought that you use in the selection of more costly handling equipment.

Fairbanks Trucks are made of wood for flexibility and handling ease and are steel-bound wherever protection is needed.

Phone Your Nearest Dealer

A countrywide service through dealers in every territory enables you to obtain Fairbanks Trucks immediately. Phone your nearest dealer. He can supply you from stock at a moment's notice.

The Fairbanks Company
Broome and Lafayette Sts.
New York

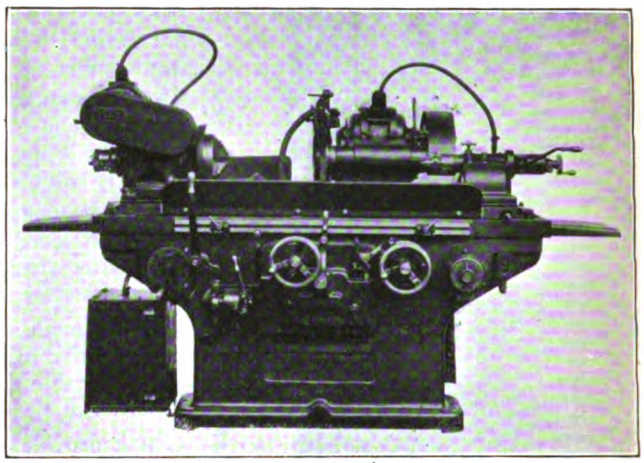


For ... vertised in this issue write Industry Illustrated

A New Universal Grinder

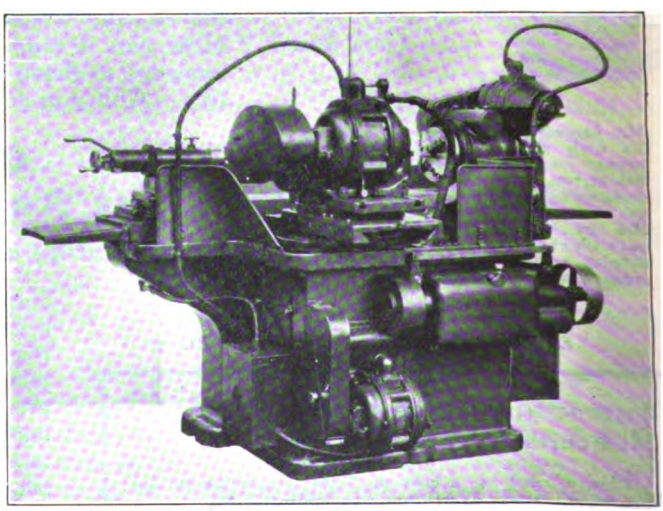
THE new self-contained universal grinding machine, manufactured by Cincinnati Grinders, Incorporated, Cincinnati, Ohio, is practically the same in dimensions and range as the regular countershaft drive type of universal machine built by this company.

The drive to the headstock is by means of a motor mounted in the headstock housing. The drive to the headstock plate is by means of a silent chain and worm. A sprocket on the motor shaft transmits power by



means of the silent chain to the sprocket fixed to the worm shaft. The latter in turn transmits power to the worm wheel to which the drive plate is fastened. The worm is of steel, hardened and ground, and the worm wheel is of hard bronze. The latter is partially submerged in oil and as it revolves carries the lubricant to the worm which drives it. Provision for taking up the chain for wear is made in endwise adjustment of the motor frame on the headstock housing.

The headstock motor is ¾ hp. adjustable speed, 600 to 1800 r.p.m. In this motorized headstock there is practically the same design and construction ideas as in the



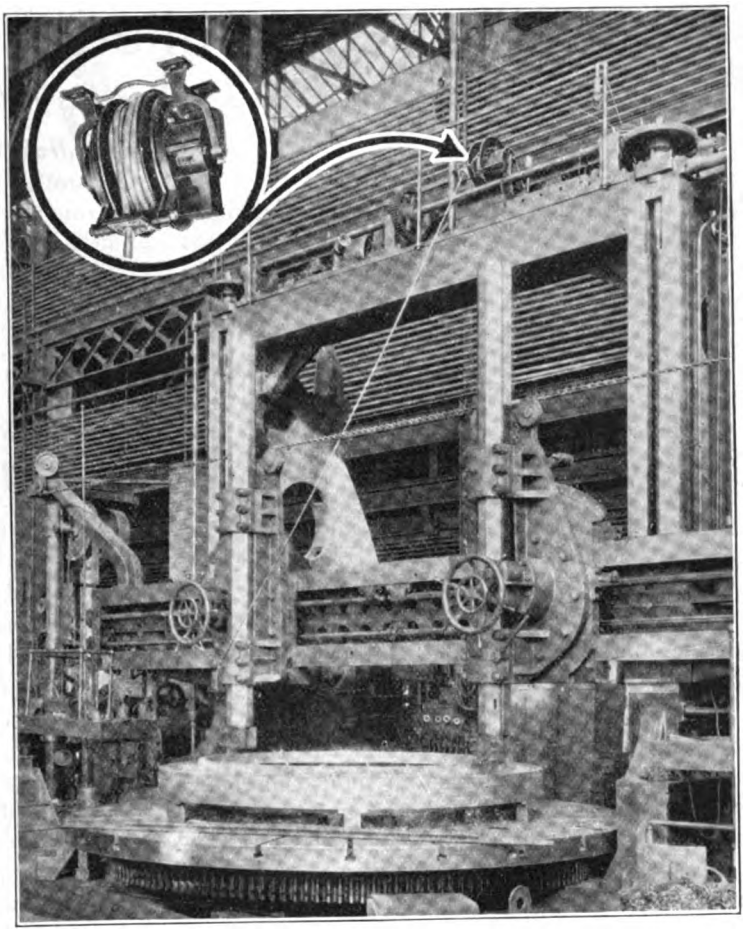
plunge cut grinder headstock. The headstock motor is of D. C. type, 230 volts, to insure a sufficient number of different speeds for a wide range of r.p.m. of work. The drive to the wheel spindle is through a single speed 1700 r.p.m., 5 h.p. motor—the connection between the motor and the pulley on the wheel spindle being made by an endless belt which runs over an idler with spring tension to compensate for belt stretch.

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Reelite

The handy light on a reel
For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connection in place of light so that it will furnish current for small machinery, and portable drills, etc.



Constant-duty type of Reelite with ball-bearing cable outlet used to convey power current to boring mill at Allis-Chalmers Co., West Allis, Wisconsin.

Just enough cable, never too much, paid out by Reelite

As this boring mill moves,—whether little or much—Reelite pays out or retrieves the power-carrying cable. Never too little. Never too much. No slackness. No undue tension. A Reelite is *easy on cable.*

Wherever power must be supplied to moving machinery, Reelite should be on the job—saving cord renewals, eliminating lay-offs while cable breaks are repaired, constantly safe-guarding the weakest link in the chain between motor and power house.

Constant-duty Reelites frequently save their cost in cord-renewals the first year or two. After that, their savings are net, for the many years that they last.

Let us send you our latest descriptive literature showing all types and sizes. Drop us a line today,—without obligation, of course.

APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue, Chicago, U. S. A.*
New York—150 Varick St. Los Angeles—340 Azusa St.

CONSTANT DUTY

Reelite

REG. U. S. PAT. OFF.

Carries Current Where Needed

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Engine Indicators

Bacharach Engine Indicators of the Maihak Type are described and illustrated in Bulletin 261, which has been issued by the Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.

Traveling Grate Stoker

The Coxe Traveling Grate Stoker is described and illustrated in a 16-page booklet, which has been issued by the Combustion Engineering Corp., 43 Broad St., New York.

Truck Platforms

An illustrated circular describing Wilder-Strong Steel Bound Truck Platforms and Handling Equipment has been issued by the Wilder-Strong Implement Co., Monroe, Mich.

Electric Furnace Steel Castings

A folder containing twelve bulletins which illustrate and describe Electric Furnace Steel Castings has been issued by the Lebanon Steel Foundry, of Lebanon, Pa.

Industrial Heating Processes

A loose-leaf catalog entitled "Data on Industrial Heating Processes," which contains a thumb index of subjects, namely, Combustion Data, Engineering Data, Burner Equipment, Standard Small Furnaces, Large Furnaces, and Auxiliary Equipment, has been issued by the Surface Combustion Co., of New York. Illustrations, tables and graphs are used throughout the book.

Productimeters

Bulletins Nos. 1, 2, and 3 from a series of catalog sections describing and illustrating Productimeter Hopper Counters, Productimeter Conveyor Counters, and Productimeter Model L-12 Lineal Measuring Reel, respectively, have been issued by the Durant Mfg. Co., 655 Buffum St., Milwaukee, Wis.

"Filling Station Layout and Design"

is the title of a 53-page booklet, profusely illustrated with charts, sketches and photographs for the guidance of "Treasure Island Builders," which has been issued by S. F. Bowser & Co., Inc., Fort Wayne, Ind.

Pressed Steel Trucks

American Pressed Steel Trucks are illustrated and described in a small booklet which has been issued by The American Pulley Co., 4200 Wissahickon Ave., Philadelphia, Pa.

Die Heads

"Eighteen Vital Questions to Ask When Selecting a Die Head" is the title of an illustrated booklet issued by The Eastern Machine Screw Corp., of New Haven, Conn.

Single Phase and Polyphase Motors

Specification and instruction sheets on Repulsion Start Induction Single Phase Motors and also on Squirrel Cage Induction Polyphase Motors have been issued by the Century Electric Co., 1806 Pine St., St. Louis, Mo.

Boiler Meters

Bulletin No. 43, containing 36 pages of illustrations and description of Bailey Boiler [illegible] has been issued by the Bailey Meter Co., Cle[illegible]

Recording Voltmeters

Bristol's Recording Voltmeters are described and illustrated in the 24-page Catalog, No. 1502, which has been issued by The Bristol Co., Waterbury, Conn. List prices have also been issued.

Pneumatic Tube Systems

G&G Atlas Pneumatic Tube Systems are illustrated and described in a 12-page catalog, No. 2175, which has been issued by G&G Atlas Systems, Inc., 535 West Broadway, New York.

Electric Hoists

Lo-Hed Electric Hoists are described and illustrated in a 42-page catalog which has been issued by the American Engineering Co., Philadelphia, Pa.

Centrifugal Pumps

"A Further Investigation of the Performance of Centrifugal Pumps When Pumping Oils" is the title of a report by Robert L. Daugherty to Goulds Pumps, Inc., Seneca Falls, N. Y., which has been issued by the company.

Rapidumps and Rollovers

Easton bodies are described and illustrated in Bulletin 303, which has been issued by the Easton Car and Construction Co., Easton, Pa. The Special Rollover Concrete Body is featured in this bulletin.

Belting

Cleve-Oak Leather Belting is illustrated and described in a 36-page booklet which has been issued by The Cleveland Oak Belting Co., Cleveland, Ohio.

Glass Front Counter

Durand Glass Front Steel Top Display and Storage Counters are described in an illustrated circular issued by the Durand Steel Locker Co., 33 South Clark St., Chicago, Ill.

Electric Tools

Thor Universal Electric Drills are illustrated and described in a folder, including specifications, which has been issued by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago, Ill.

Baghouse for Fume Recovery

"Dracco" Twentieth Century Baghouse for Fume Recovery is illustrated and described in Bulletin No. 14, which has been issued by The Dust Recovering & Conveying Co., Harvard Ave. and East 116th St., Cleveland, Ohio.

Cleaning System

The Tabco Exidust Cleaning System for power plants and factories is described in an illustrated folder which has been issued by The Allen & Billmyre Co., Inc., Grand Central Palace, New York.

Drag Line Buckets

Pamphlet 666 which illustrates and describes Hayward Drag Line Buckets has been issued by The Hayward Co., 50 Church St., New York.

"And Then They Discovered Kinite"

is the title of an illustrated folder describing Kinite—a cast alloy of steel—which has been issued by The Kinite Corp., 1338 St. Paul Ave., Milwaukee, Wis.

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Feet for Shoes

or



Shoes for Feet?

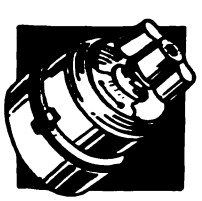
No one motor of standard type and design will operate a number of different electrical appliances equally well—any more than one shoe can be made to fit all feet. Somewhere, something is bound to "pinch".

This illustrates the principal difference between Domestic motors and ordinary fractional horsepower motors. Domestic builds nothing but *special* motors—adapting design and modifying features to the actual conditions of service—instead of asking the appliance manufacturer to accommodate his product to the specifications of a stock motor.

In the past 13 years Domestic has designed and built more than fifty different motors for as many special jobs—industrial, household and commercial.

The experience of users has demonstrated the soundness of this Domestic policy. Not only have Domestic motors displayed superior efficiency in operation, but the almost total absence of ordinary service troubles is unique in the industry.

Domestic Electric salesmen, each a trained service engineer, are always available for consultation to anyone who has a problem involving fractional horsepower motors in the manufacture, sale or servicing of electric appliances.



For protection from overload - the Domestic Automatic Safety Switch

THE DOMESTIC ELECTRIC COMPANY
7209-25 St. Clair Ave. CLEVELAND, OHIO
Manufacturers of fractional horsepower motors exclusively (87)

Domestic Electric Motors

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READERS' GUIDE
to Profitable Equipment
Practical Helps for Mill and Factory Managers

BEARINGS. Transmission and Line Shaft

Engineering Data on Anti-friction Bearings that permit higher speed at the lowest friction loss. See page 31. The New Departure Mfg. Co.

Certified Surveys Showing the Savings effected in the plants of 17 manufacturers is offered by SKF Industries, Inc. See page 4.

An Oilless Bearing is described on page 75 by the Arguto Oilless Bearing Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

For pushbutton control of electric motors without extra cost see page 105. The Triumph Electric Co.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 41.

A Motor That Is Giving Remarkable Service is illustrated on page 67 by Howells Electric Motors Co.

Descriptive Bulletin explains the complete line of motors from one-quarter to forty HP. single and polyphase. Manufactured by the Valley Elec. Co. Page 84.

Complete Details can be obtained on a Motor that gives long service. See page 81. Master Electric Company.

Information on a Drop Cord System that saves its cost many times in lamp renewals. See page 99. Appleton Electric Co.

The U-Re-Lite Hand Book is a 96-page treatise on electrical control. For a copy see Colored Advertising section. The Cutter Company.

Motors Built for Specific Production Requirements. See page 101. The Domestic Electric Company.

Descriptive Bulletins on Motors for practically every purpose are offered by Diehl Manufacturing Company. See page 74.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 92.

More Production through better lighting. See Colored Advertising section. National Electric Light Association.

Information on lower cost welding for machine bases. See Colored Advertising section. Lincoln Electric Co.

MAINTENANCE

Information on Scientifically prepared protective Coatings for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

Brushes for every industrial purpose. Also brooms. See page 37. The Osborn Mfg. Co.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 69.

An Interesting Booklet and Sample of a Waterproof, Acid, Alkali and Brine Resisting Paint. American Asphalt Paint Co. See page 79.

A Catalog, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 73. Durand Steel Locker Co.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 110. The Nitrose Company.

Barreled Sunlight for Industrial Painting is described in the bulletin of the U. S. Gutta Percha Company. See page 3.

Metal Case Brooms for industrial use. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 40.

Catalog No. 100 is a 32-page book on air moving. See page 106. New York Blower Company.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co. Page 44.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 35. The Vortex Manufacturing Co.

An Illustrated Catalog on Hand Trucks that are steel-bound wherever wooden surfaces must be protected can be obtained from The Fairbanks Company. See page 98.

Fifty Years of Conveyor Service, the record of the Logan Company. Page 1.

MATERIALS HANDLING EQUIPMENT

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 109.

Turntables that facilitate handling are described in special bulletin—No. 14—of the Easton Car and Construction Company. See page 77.

A Light Weight Substantial and Highly Efficient Electric Hoist that can be used anywhere that a chain block is used. See page 96. Roeper Crane & Hoist Wks., Inc.

Catalogs No. 12 and 19C describe the complete line of Lansing Trucks and trailers. See page 105. Lansing Company.

A Special Magnet-equipped F Swivel Hoist that does four times the work i the time is described on page 109. Baker

A sixty-eight page "Book of Illustrated Economies," giving figures and actual photographic illustrations and a sixty page, "Floor Operated Hoist Catalog" are offered by the Shepard Electric Crane & Hoist Co. Back Cover.

Various combinations of Overhead Conveying Systems are shown on page 85 by the Chisholm-Moore Mfg. Co.

Crane Catalog No. 200 contains information on cranes that have a record for reliability during the past 35 years. See Colored Advertising section. Whiting Corporation.

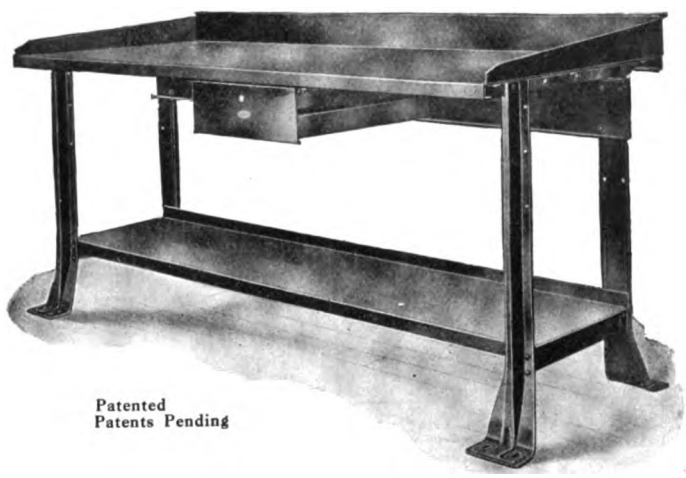
An Overhead Monorail System that can be applied to every industry is shown in Colored Advertising section by The Louden Machinery Company.

Bulletins describing the Pneumatic Conveying of granular, injurious, dusty materials can be obtained from the Dust

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"HALLOWELL" ALL-STEEL Factory Equipment

ready-made benches cost less!



HERE you see a "Hallowell" all-steel work bench that needs no carpenter's costly time. It won't splinter. It can't burn. It's far ahead of any wooden bench for wearing qualities. All-steel benches come in various sizes to fit every factory need and *they are always in stock* so you can have them when you want them and in any number, too!

IF you prefer wooden tops—"Hallowell" Steel Bench Legs are at your service. They save time and a lot of money. No bench can get wobbly when built on "Hallowell" Steel Legs.

OUR All-Steel Tables, Steel Bench Drawers, with or without locks, and Steel Tool Stands, mounted on casters might be just what you are looking for.

WRITE today for our special folder that gives complete description of these various items and illustrates our All-Steel benches, too! At the same time, we'll be glad to send you our complete factory equipment catalog.

Write for circulars, to-day!

Standard PRESSED STEEL Co.

Box 8, Jenkintown, Pa.

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—applied with a hammer

Bristol's fasteners and a hammer—that's all you need to join the ends of a belt.

As easy as driving a nail. Simply square up the ends of the belt, butt them together on a block of wood and drive the fasteners through.

Keep Bristol's handy and you will forestall many an expensive delay. For thirty-five years a staple article at most mill supply houses. Write for Bulletin CE-722, The Bristol Co., Waterbury, Conn.

BRISTOL'S
PATENT STEEL
BELT LACING



Recovering and Conveying Co. See Colored Advertising section.

The Advantages of Specifying Hyatt Roller Bearings on Trailers is shown in Colored Advertising section by Hyatt Roller Bearing Company.

Gasoline Locomotives that give tremendous power with big economy in operation and upkeep. See Colored Advertising section. The Fate-Root-Heath Co.

Factory Certified Wire Rope for materials handling purposes. See Colored Advertising section. Williamsport Wire Rope Company.

"The Atlas of Mechanical Handling" is a book containing information on overhead carrying systems which applies the railroad principle of two rails. See Colored Advertising section. The Atlas-Chicago Co.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 95. Canton Foundry and Machine Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 110.

A New Track Unloader that fits right on to the coal car is described on page 111 by the Chicago Automatic Conveyor Company.

"Snapshots of Sensible Savings" is a book describing various uses of a Tier-Lift Truck. See page 107. Lakewood Engineering Co.

A Handy Tool for Moving the Heaviest of Railroad Cars. For information see page 74. The Advance Car Mover Company.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzgar Company, Inc. See page 94. Booklet offered.

A Nationwide Service is offered by the Link-Belt Company for economical handling of materials and transmission of power. See page 114.

A Chain Hoist with 21 points of superiority. See page 49-50. Wright Mfg. Company.

Information on Various Types of Trucks and Tractors is shown on page 45 by The Yale & Towne Mfg. Co.

Double Ball Race Roller Bearing Wheel Type Casters for Trucks that increase the load capacity. See page 32. Bond Foundry & Machine Co.

Hand Trucks that are noted for exceptional strength and flexibility. See page 98. Fairbanks Co.

POWER PLANT EQUIPMENT AND AUXILIARIES

Catalog Describing a Boiler Feed Water Regulator can be obtained from the Chaplin-Fulton Mfg. Co. See page 92.

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 111.

A Steam Trap on a 90-Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 76.

Free Trial Offer of a Steam Trap that spells fuel economy can be obtained from the Sarco Co., Inc. Also write for booklet R. 268. See page 46.

For Complete Data on Crushers, Pulverizers and Shredders. See Jeffrey Mfg. Company. Page 39.

Catalog No. 860 describes complete line of Electric Blowers for ventilating and other purposes. See Colored Advertising section. Buffalo Forge Co.

An Improved Steam Trap on 60 days free trial. See page 36. Illinois Engineering Co.

Bulletins on Jennings Heating Pumps, containing valuable

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For Heavy Duty

The Reynolds All Steel Truck

MADE from the best materials and quality workmanship in the following sizes: Platforms 2x4 to 3x6 feet, diameter of wheels from 12 to 18 inches, diameter of casters from 6 to 9 inches, height to top of platform from 14 to 19 inches, capacity 2,000 to 4,000 pounds. For further specifications send for Catalog No. 12.

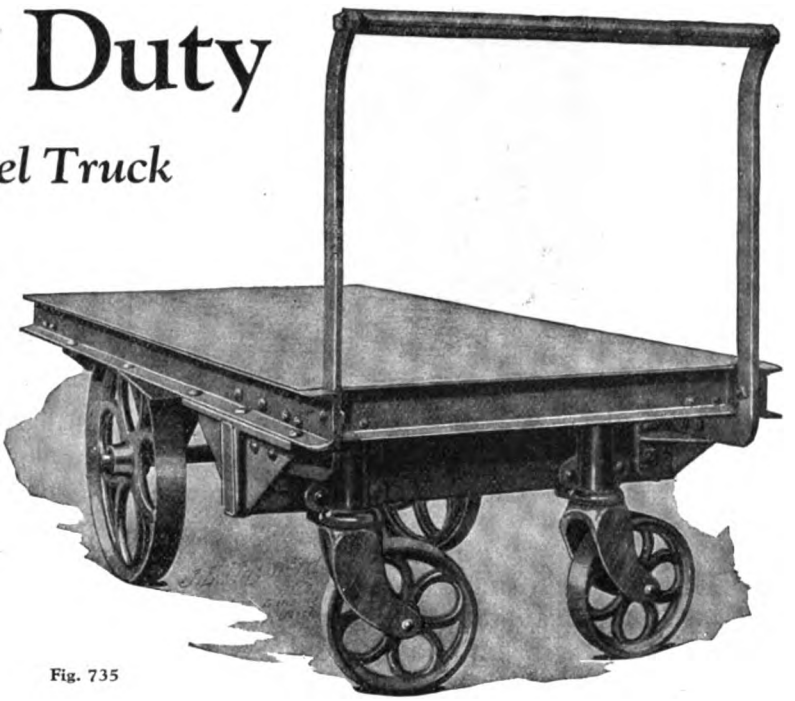


Fig. 735

LANSING-COMPANY

Factory: Lansing, Michigan. *Branches:* Boston Kansas City Minneapolis Chicago New York Philadelphia Cincinnati

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UNIQUE THIN LEAD Colored Pencils

SOMETHING wanted for years! A colored pencil with the same diameter lead as in No. 1 writing pencils: can be sharpened in a pencil sharpener to a needle-point. UNIQUE has the best and *thinnest* lead.

Makes *fine lines* for figuring, checking, underscoring, blue-prints, charting, etc.

The 12 colors enable executives to have their own color symbol.

At dealers, or write us direct



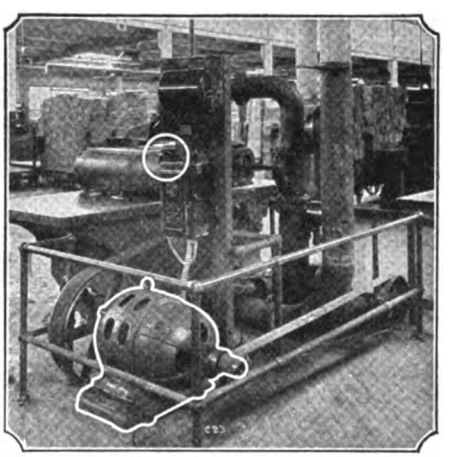
12 Colors

Blue . . .	1206
Red . . .	1207
Green . .	1208
Yellow . .	1209
Purple . .	1210
Brown . .	1212
Orange . .	1214
White . .	1215
Lt. Blue. .	1216
Pink . . .	1217
Lt. Green .	1218
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$1.00 per dozen

AMERICAN LEAD PENCIL CO.
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Makers of the famous VENUS Pencils

"... push-button control" without extra cost!





Here's the simplest, cheapest, and most efficient push-button control there is. No compensator, simple wiring. Motor size makes no difference. TR Self-Start operating characteristics make it possible. The installation is in the Globe-Wernicke plant at Norwood, O.

Send the coupon for more information and quotation on sizes needed.

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The TR is an A.C. motor with improved operating characteristics—the modern super-motor. 250% starting pull instead of usual 80%. No compensator in any size. Cuts first cost and current costs. Junk old motor ideas and improve plant efficiency with the TR motor! Send coupon.

The Triumph Electric Corp.,
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Send TR motor bulletin and price list.
We need motors for these machines,
. . . . . .
(with) (without) push button control.
Name . . . . . .
Firm Name . . . . . .
Address . . . . . .
City . . . . . ***State*** . . . . .

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Investigate the outstanding merits of the type ME Fan—the fan that has been authoritatively tested and certified in the laboratories of two universities.

This 32 page book giving complete capacity sheets together with full description will be gladly sent upon request.

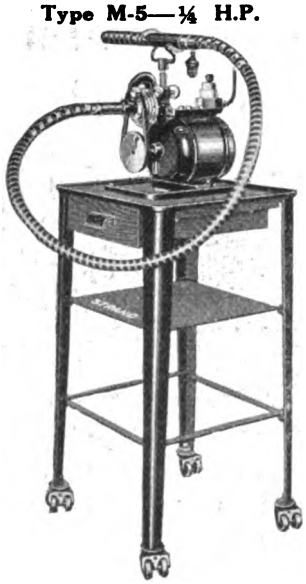
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General Offices
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So. Halsted
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Strand

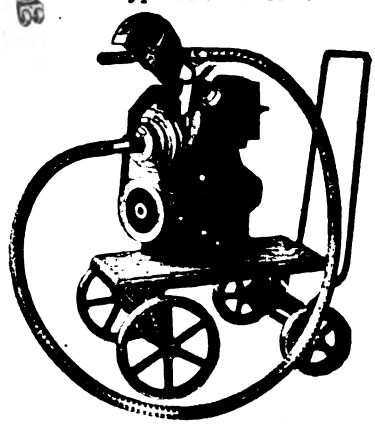
FLEXIBLE SHAFT MACHINES

Are reducing costs on many operations in

Grinding, Polishing, Rotary Filing, Buffing, Sanding, Scratch Brushing, Screw Driving and Nut Setting

Made in several types and sizes.

Type M-7—1 H.P.



Manufactured by

N. A. STRAND & CO.
CHICAGO

Main Office and Factory
5001-5009
NO. LINCOLN ST.

Send for catalog

information on heating system installations. Nash Engineering Co. on page 6.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 107.

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 72.

Chipping Hammers that save time are described in the catalog of the Independent Pneumatic Tool Co. See page 68.

High Speed Drills with forty-five years' experience behind them. See page 95. The Standard Tool Company.

Gear Cutting Machinery is described in general catalog, No. 30, of the W. A. Jones Foundry Machine Co. See Page 47.

Bulletins describing quick operating and wide opening lever vises. See page 90. Edw. Purvis & Son.

Sample Blades are Offered by Victor Saw Works. See page 109.

Special Analysis Steel can be obtained from Ludlum Steel Co. Page 104.

High Speed Drills for high speed production. See page 82. The Cleveland Twist Drill Co.

A Buying Guide for Quality Equipment is to be had in the Brown & Sharpe Mfg. Company, Catalog No. 30. See page 48.

Catalog 57B describes a Vise with seven distinct and exclusive features of construction. See page 90. The Charles Parker Company.

Complete Information on Pipe Threading Equipment is offered by The Oster Mfg. Co. See page 113.

A New Catalog showing complete line of bench wood-working machines. See page 93. Heston & Anderson.

Chrome Vanadium Wrench Kits for Millwrights, Loomfixers and other Shop Mechanics. See Bonney Forge and Tool Works. Inside Front Cover.

Cap Screw Heads that are consistently perfect. See page 77. The Ferry Cap & Set Screw Co.

A Description of a Vise built to stand plenty of rough stuff. See page 78. Prentiss Vise Co.

Literature on Flexible Shaft Equipment, unexcelled for Hard-To-Get-At places, is offered by R. G. Haskins Co. See page 108.

An interesting File Catalog and Price List can be obtained from the Simonds Saw and Steel Co. See page 34.

Tool Holders for lathe, plainer, shaper and slotter are described on page 42, Armstrong Brothers Tool Co.

Set Screws that are 30% stronger. The Allen Mfg. Co. See page 26.

Various Applications of Drill Chucks are described on pages 70-71 by the Jacobs Mfg. Co.

Hack Saw Blades of exceptional quality. See page 93. American Saw Mfg. Co.

TRANSMISSION EQUIPMENT. Including Belting

Bristol Bulletin 722 Describes a belt lacer as applied with a hammer. The Bristol Mfg. Co. See page 104.

Medart Catalog No. 43 and Discount Sheet cover dimensions, details and list prices of the entire range of power trans-

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Factories who use

SHEET METAL PARTS

In their finished product have found that these could be produced more economically and satisfactorily in our plant because we are specialists in sheet metal work. Due to our unusual methods we are able to produce

SHEET METAL PARTS OF A WIDE VARIETY



and for numerous uses and from

Steel, Iron, Copper, Brass, Monel

Punching, Blanking, Forming, Stamping, Drawing

Send us a blue print or pencil sketch and our engineering department will show you how to reduce your costs.

See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment, MacRae-Hendricks, Sweet's Engineering and Thomas Catalogues

THE BREESE BROS. CO
Cincinnati, Ohio

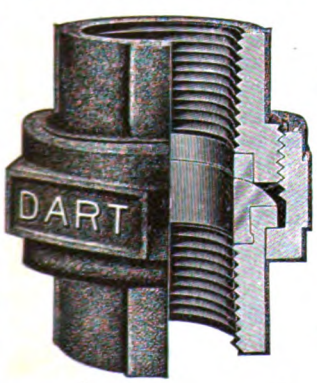
The Direct Line to Lower Steam Costs

DART UNIONS

A Dart Union saves steam because it stays tight. It doesn't require packing. It is non-corrosive.

There is nothing in a DART UNION to collect sediment—the path is straight through without cored parts to weaken the union. And bronze to bronze seating surfaces, ground to an absolute tight seating ball and socket joint, make them leak-proof.

They are guaranteed—two DART UNIONS for every one that proves defective.

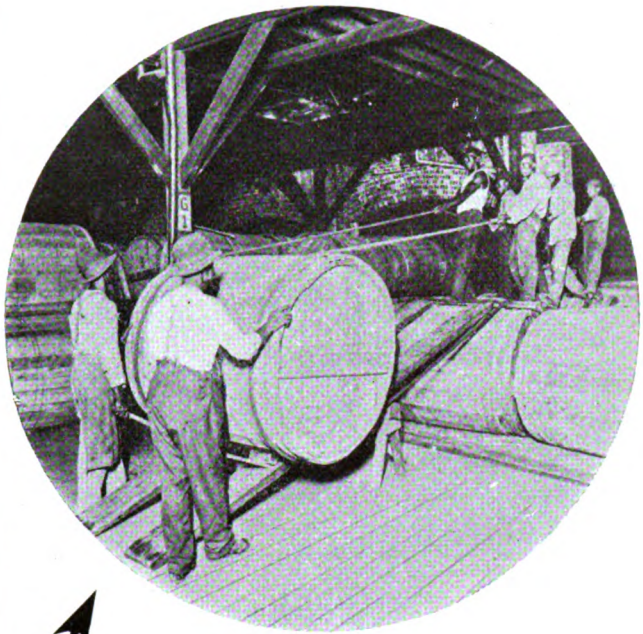


Write for a sample and price list

E. M. DART MFG. CO.
Providence, R. I.

Sales Agents
THE FAIRBANKS COMPANY
New York

Canadian Factory
DART UNION CO., Ltd.
Toronto, Ont.



Which Way Is More Efficient!

There isn't much doubt as to which way is cheaper, quicker, safer—more efficient, is there? Your problem may not be the handling of casks of this size but there are other handling or storage problems around your plant where a Lakewood Tier Lift Truck would mean a saving of from 3 to 7 men.

Why not talk with one of our engineers about your problem? You will not be obligated in any way whatsoever.

The
LAKEWOOD ENGINEERING CO.
Cleveland, Ohio



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An Executive Suggestion
For the Year 1927

"Flexible Shaft Equipment"



General Casting Grinding With H-6 Equipment

The uses of Flexible Shaft Equipment are legion. There are thousands of instances where it is more economical to Take-The-Tool-To-The-Work than to attempt to route special operations to stationary machines. HASKINS EQUIPMENTS are without a peer for the many operations of Grinding, Scraping, Filing, Metal Pattern Making, Die Sinking, Buffing, Polishing, etc.

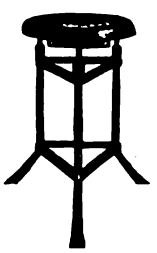
Flexible Shaft Equipment is unexcelled for Hard-To-Get-At places. Power sizes and types to meet your plant's requirements.

Write for special literature showing equipment and uses as applied to various industries.

R. G. HASKINS CO.
Portable Flexible Shaft Equipment
3457 Lake Street Chicago, Illinois
Branch Offices in Principal Cities

EVER-HOLD
TRADE MARK

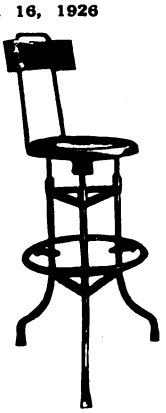
AUTOMATIC ADJUSTABLE
Steel Stools for Office, Shop and General Factory Work
Patented March 16, 1926



STEEL CONSTRUCTED

Adjustable to any desired height in a moment's time without any tools. Beautiful hardwood seats.

The patented automatic adjustment is a radical departure from the old fashioned screw type or angle iron stool. It is instantaneous.



A complete line of Stools and Chairs to suit any requirement. Built for

SERVICE
COMFORT
BEAUTY
ECONOMY

ASK FOR OUR LATEST CATALOG



Eastern Distributors:
INDUSTRIAL SALES CO.
328 Main St., E. Rochester, N. Y.

Western Distributors:
ADOLF RRESE CORPORATION
726 So. Hope St., Los Angeles, Calif.

Other Distributors Wanted
VITEK MFG. CO., Omaha, Neb., U. S. A.

mission equipment made by The Medart Co. See page 38.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 110.

MM 66 is a booklet explaining the vital necessity for speed flexibility of transmission drives. Reeves Pulley Co. See Colored Advertising section.

Copy of L. H. Hopkins' Article, "Group Drives, More Economical for Most Conditions." Chas. A. Schieren Company. See Colored Advertising section.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 106. N. A. Strand & Co.

Belt Lacers that result in greater transmission efficiency. See pages 86-87. Clipper Belt Lacer Co.

A 60-Day Trial on a Belt Preservative. See page 72. Cling-Surface Company.

A New Disc Clutch for the first time on the market is shown on page 91 by the Conway Clutch Company.

A New Booklet, "How, When and Where to Use Burmaline Belting," for practical economies. See page 2. Burrell Belting Company.

Twin Disc Clutches that meet quantity production requirements of large and small machine tools are described on page 83. Twin Disc Clutch Company.

Flexible Shaft Machines for grinding, polishing, filing, buffing, etc. See page 106. N. A. Strand & Company.

MISCELLANEOUS

"Horton Tanks for Fire Protection," is the name of the booklet put out by the Chicago Bridge & Iron Works. See Colored Advertising section.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 107.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 95.

For the Disposal of Factory Waste and Sweepings in an economical sanitary manner. See page 42. Goder Incinerator Corp.

Thin Lead Colored Pencils that can be sharpened to a needle point are described by American Lead Pencil Co. See page 105.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 103. Standard Pressed Steel Company.

A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 43.

Free Trial of their ball-bearing, I-Beam Trolley is offered by the Richards-Wilcox Mfg. Co. See page 25.

Catalog No. 9 Describes a Practical Method of Checking Temperatures. See Colored Advertising section.

A Commonsense Chair for factory use. See page 96. Mfg. Equipment & Engineering Company.

The Latest Catalog describing Automatic Adjustable Steel Stools for office, shop and factory. See page 108. Vitek Mfg. Co.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co. Page. 93.

An Economical Means of Cleaning Parts and Products is shown on page 80. Oakite Products, Inc.

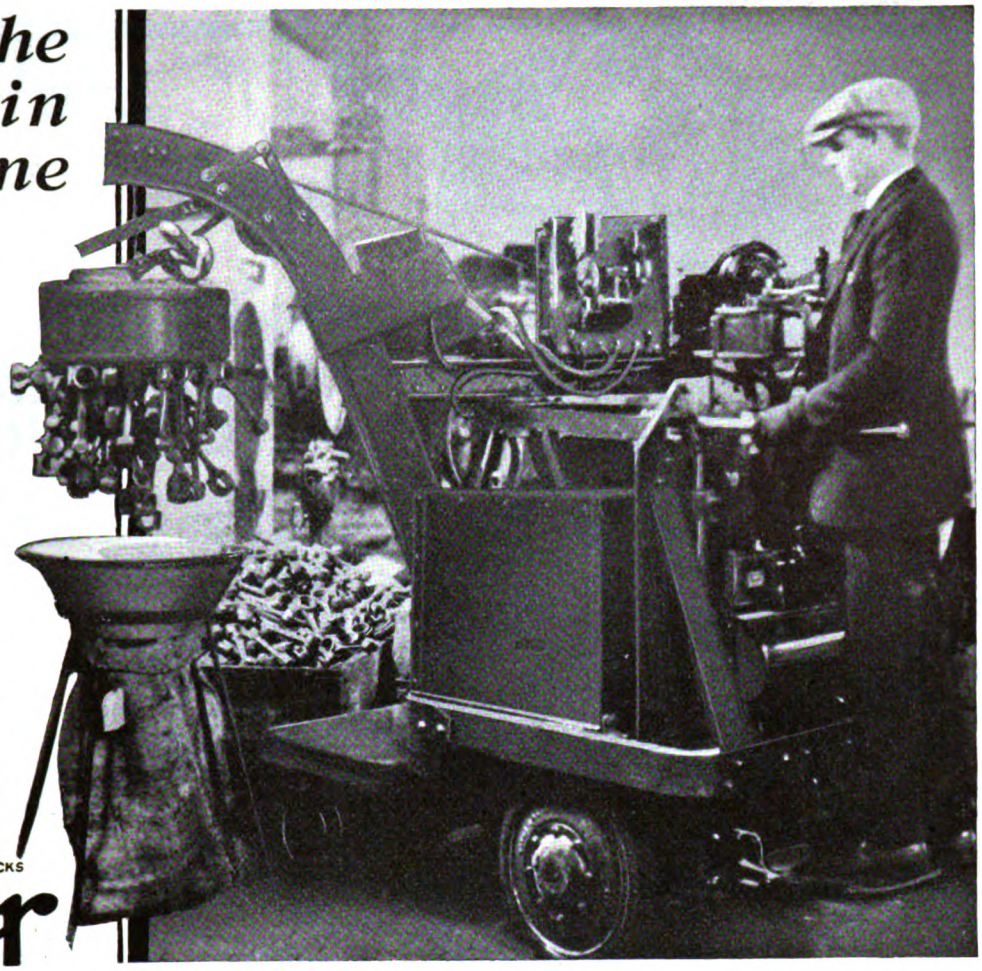
Ventilating Installation of remarkable character is shown in Colored Advertising section.

A Booklet Describing Counters for rate setting and production work. See page 73. The Veeder Mfg. Co.

A Booklet Describing Temperature Control is offered by Taylor Instrument Companies. See page 89.

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4 times the work in ¼ the time



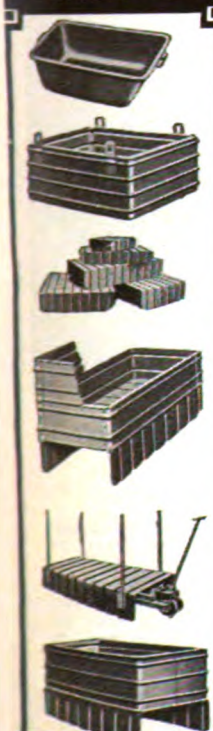
THIS special magnet-equipped Baker swivel hoist at a large automobile plant enables one man to unload a box car of loose castings in 45 minutes, a job that formerly required four men three hours with wheelbarrows.

The knowledge and experience of Baker engineers are constantly at the disposal of both customers and prospects. May we help solve your problems also?

The BAKER-RAULANG *Co.*
2179 West 25th Street
CLEVELAND, OHIO

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.
Baker

POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



What's Ahead in 1927?

DURING the past few years POWELL Standardized Pressed Steel Material Handling Equipment has been a big factor towards providing greater speed and increased economy for many of America's outstanding manufacturers. During 1927 your problems may be simplified, workers made more productive, delays eliminated and greater efficiency established thru use of POWELL Equipment.

It's a big thought for the New Year. By all means write at once for our illustrated literature, prices and complete details.

The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown



Why Experiment?
VICTOR BLADES DO THE TRICK

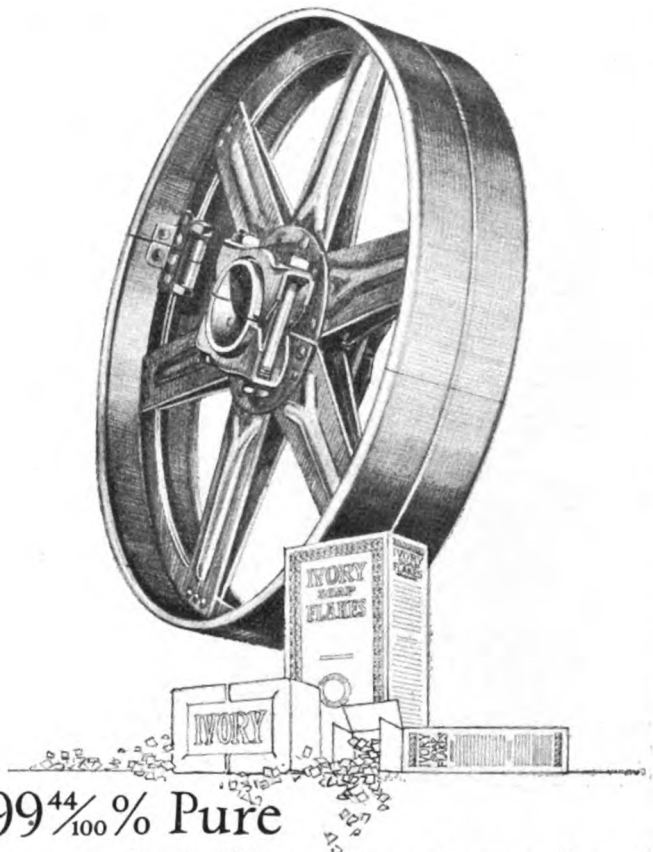
You occasionally hear of other blades that are supposed to be as good, but it doesn't pay to experiment if you can be sure of one blade.

Victor blades will do the trick. They are relied on in shops throughout the country and they will answer your cutting requirements satisfactorily.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

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99 44/100% Pure
- and the "American" standard is equally high

THIS mark established by the Proctor and Gamble Company for Ivory Soap is very close to perfection. Allowing for the human factor it *is* perfection. That it is so accepted in the public mind has been proved by years of faithful support and by adoption of the phrase as a symbol of all that can be attained.

No such goal is ever reached without the most painstaking attention to details and an unrelaxed vigilance at every step of manufacture.

This same care and vigilance have governed the design and making of "American" Steel Split Pulleys for the thirty-some years since the first one was made. Strength with light weight (to impose no unnecessary power load); ease of application (the construction principle which makes it possible to install an "American" Steel *Split* Pulley without stripping a busy line shaft); transmission efficiency (derived from true-running; firm grip on the belt; the center groove that permits air to escape and the pulley arms that cut the air instead of fanning it);—these and other features of design and construction have doubtless been the reasons why leaders in industry, with exacting standards like those of Proctor and Gamble Company, have equipped their plants with "American" Pulleys.

These "American" principles are fully explained in special literature. Write for it.



PATENTED

"American" Pressed Steel Shaft Hangers are light, rigid, efficient and adjustable. Their strong tubular design adds to the good appearance of any shop.

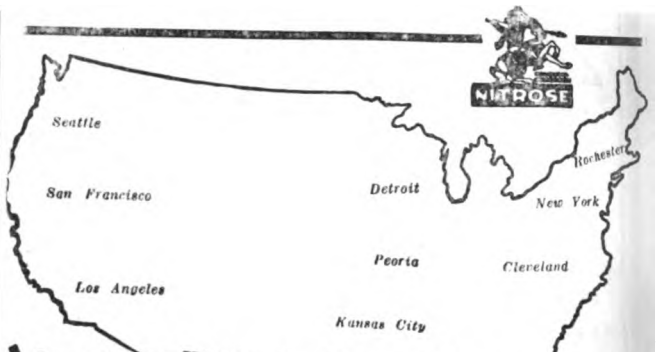
The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Avenue Philadelphia, Pa.

For nearest distributor see Mac Rae's Blue Book

AMERICAN
PRESSED STEEL HANG[illegible] | STEEL SPLIT PULLEYS
PA PATENTED



Nation Wide Service that CONQUERS CORROSION

All types of industry (where heat, rust, gas, grease, chemicals, acid fumes, brine solutions, ammonia and alkalis attack metal) now use NITROSE.

NITROSE insures longer protection than any paint you can buy. Nitrose can be applied with no more preparation than wire brushing the scale. Needs no mixing and no priming coat. Can be spread over wet, oily and hot surfaces. Only one coat is needed. NITROSE costs less by saving labor, going farther, lasting longer.

Nitrose resists the action of heat, acids, chemicals, time and elements on all metal work.

This liquid armor welds itself right down into the bare metal through rust and oil.

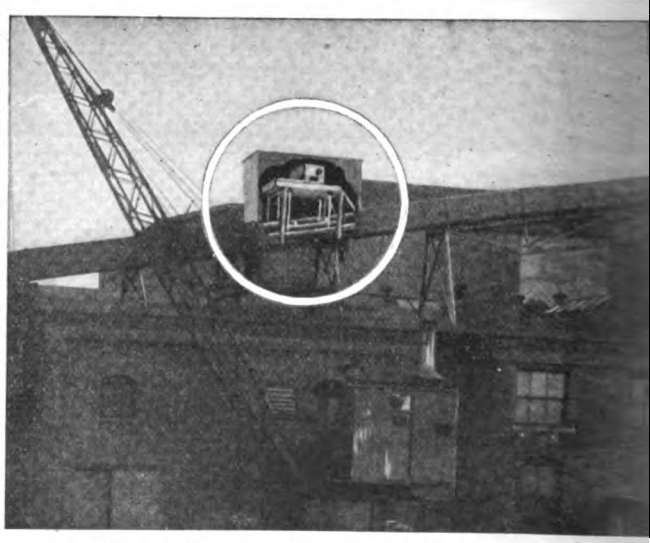
Sell YOURSELF on NITROSE

We have a plan that will make it possible for you to sell yourself without expense to you. Write for it. Address main office

The NITROSE Company, 1500F Peoria Life Bldg., Peoria, Ill

NITROSE

Time, Rust, Acid, Heat Resisting Liquid Armor that Spreads Like Paint



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the material move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

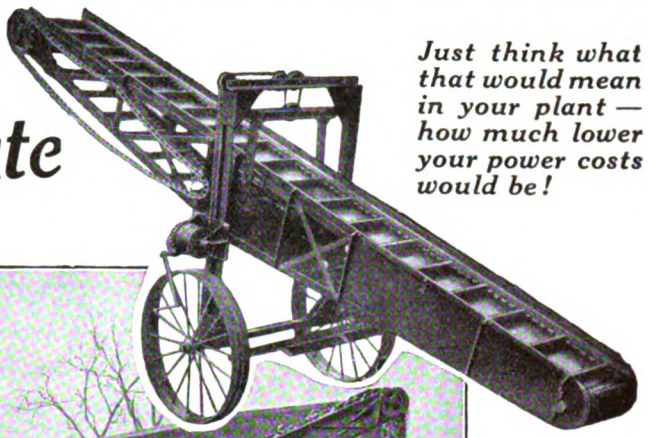
Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J

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Unloads 2 Tons of Coal a Minute



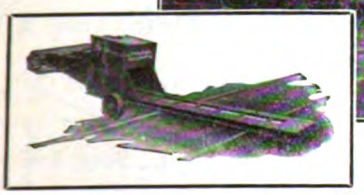
Just think what that would mean in your plant — how much lower your power costs would be!

That is why you need the new Chicago Automatic Model T. V. Truck Unloader. No shoveling—unloads a whole car of coal in an hour—no pits necessary. Only three inches high on the rail — goes under any car.

Chicago Automatic Conveyors have for years reduced coal handling costs in hundreds of industrial plants in the United States and Canada.

There's a Chicago Automatic Conveyor right in your neighborhood handling coal more economically year after year. Let us tell you about it.





"A few selected territories are still open for sales representatives. If interested, write for our proposition."

Branches in all principal cities

CHICAGO AUTOMATIC CONVEYOR CO.

Originators of the Portable Conveyor

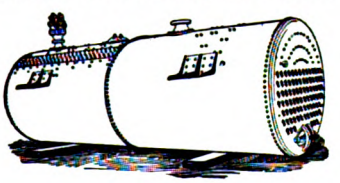
982 Old Colony Building, CHICAGO, ILL.

Vertical Water Tube



WICKES Steam Boilers

Ask for Bulletins describing in detail—sent free.



Horizontal Return Tubular

THE WICKES BOILER CO.

Saginaw, Michigan

SALES OFFICES:

Pittsburgh, 1218 Empire Bldg. New York, 501 Fifth Ave. Detroit, 1116 Penobscot Bldg.
Chicago, 33 No. Clark St. Seattle, 736 Henry Bldg.

Horizontal Cross Drum Water Tube



The One Joint Header Boiler.

MEN WANTED

with an Acquaintance Among Industrial Executives

AN opportunity for men who have sold to industrial plants or for others with a knowledge of plant practices who are looking for the chance to become salesmen. Positions open in industrial centers and good territories will be assigned. Earnings are unlimited and good future for men who make good.

The work consists of selling subscriptions for one of the best known publications in the industrial field. A magazine published for 35 years with an enviable reputation for its service to industrial executives. Men who can give only a part of their time will also be considered. Write giving an outline of your experience. Address box 535, Care INDUSTRY ILLUSTRATED, 381 Fourth Ave., New York

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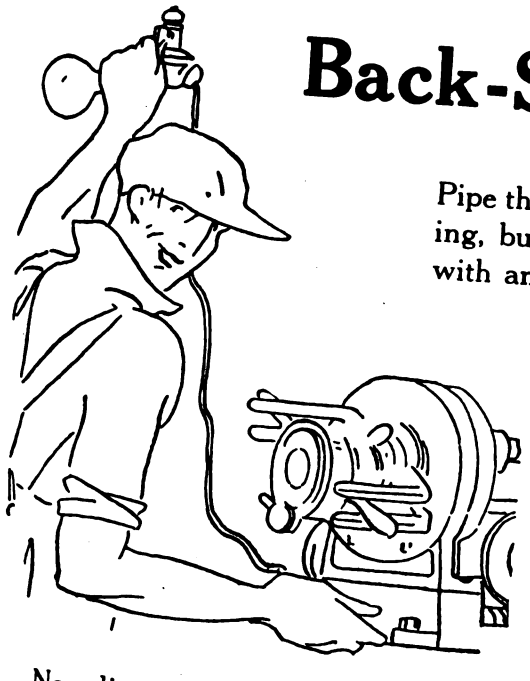
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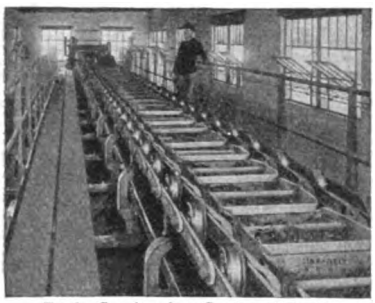
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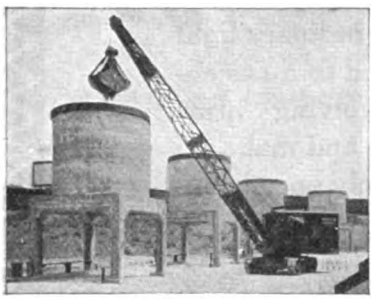
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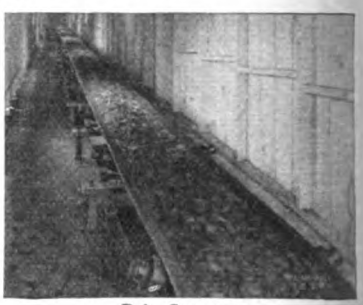
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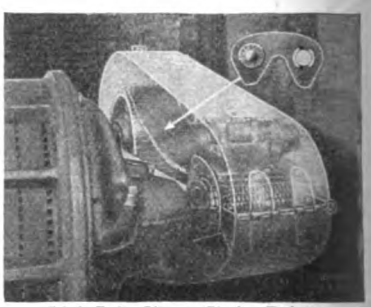
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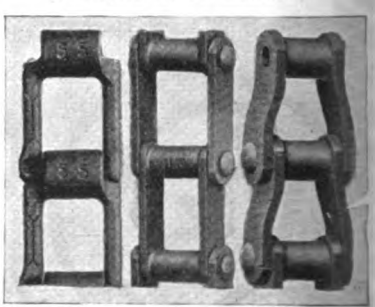
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Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

What Price Pessimism?

The current year was ushered in with a literal deluge of optimistic predictions by economists and financial authorities.

What is back of all this optimism? Is it mere "whistling to keep up courage," or is there something real on which to base it?

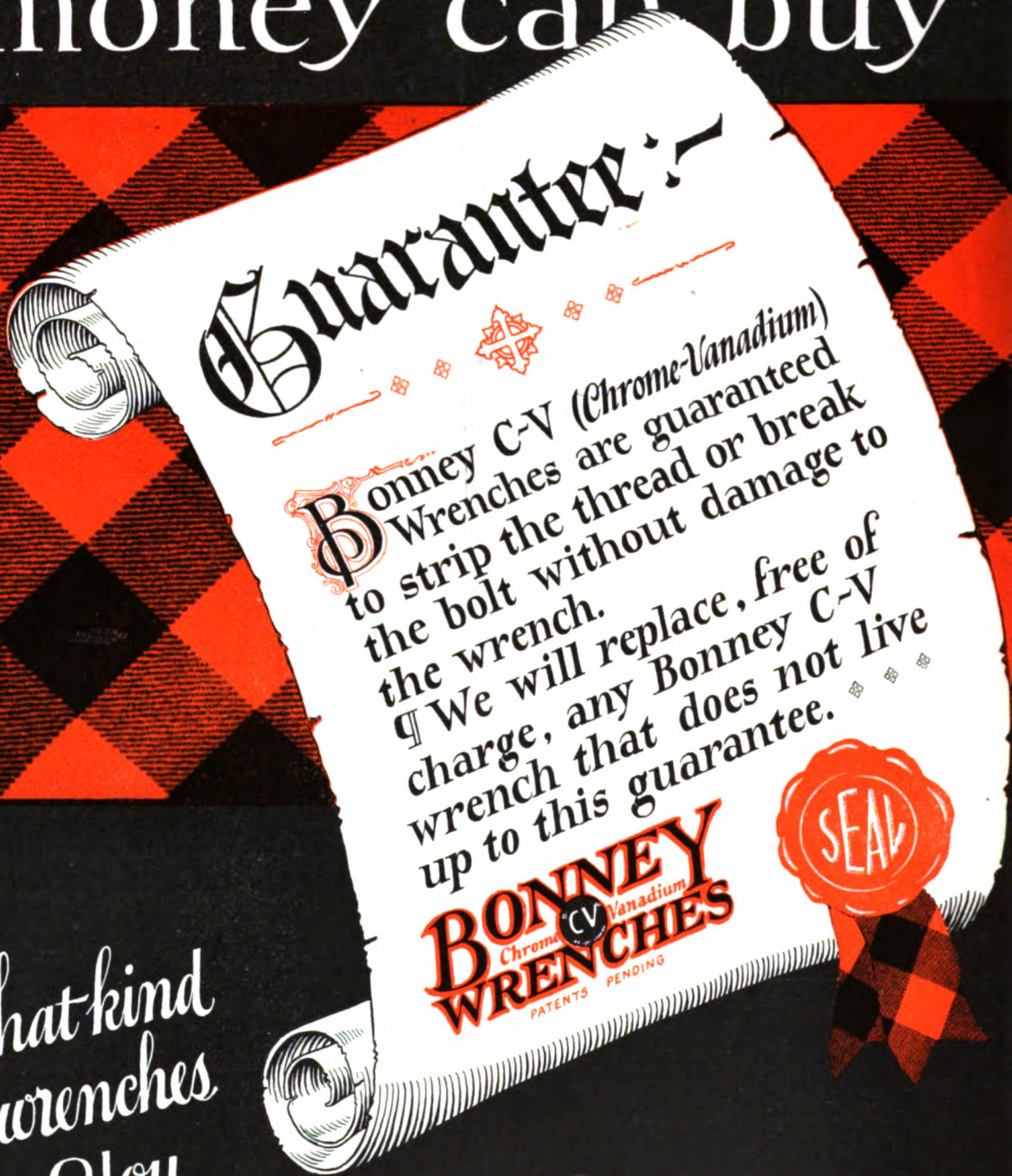
On page 7, of this issue, is a brief summary, in graphic form, of some of the factors that constitute the groundwork of this country's prosperity. To any man who is inclined toward pessimism, we recommend a study of facts presented on that and the two following pages.



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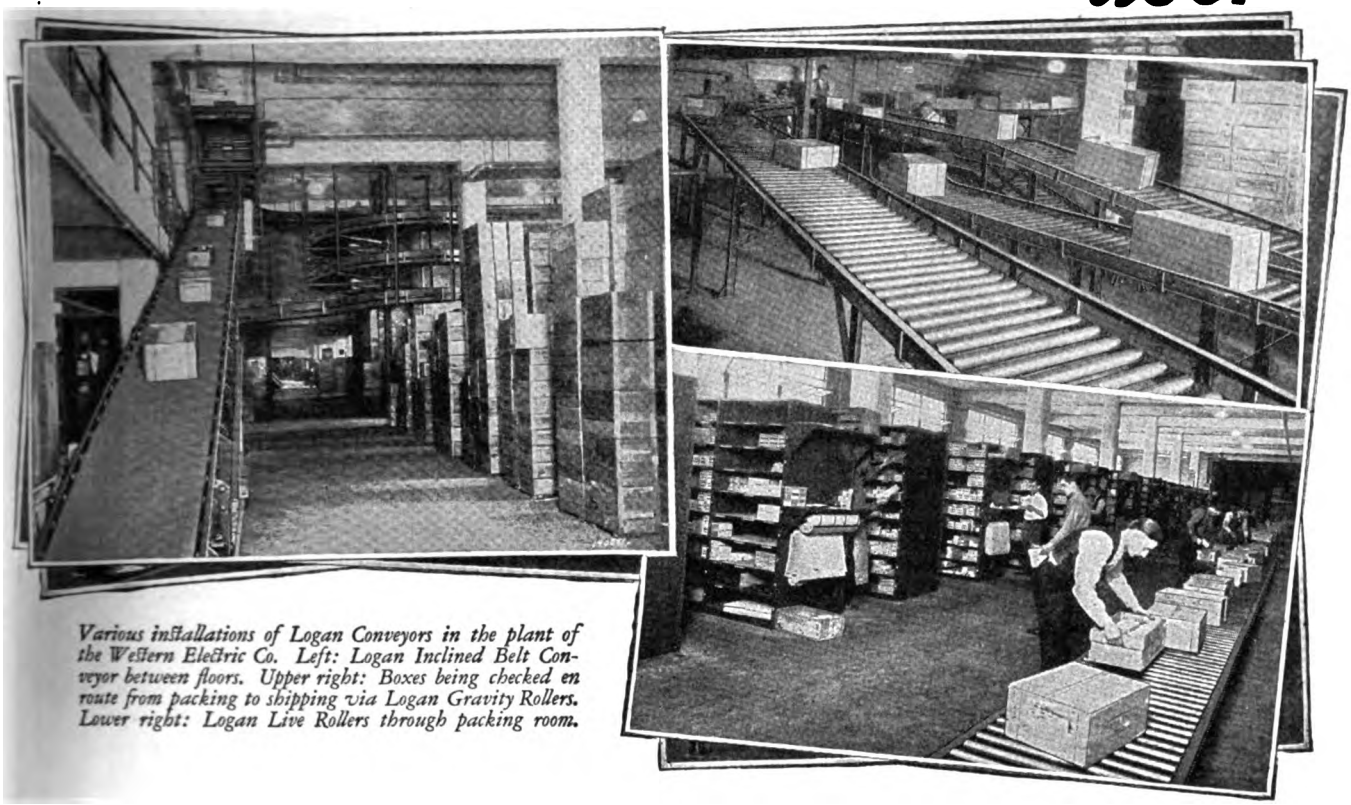
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Various installations of Logan Conveyors in the plant of the Western Electric Co. Left: Logan Inclined Belt Conveyor between floors. Upper right: Boxes being checked en route from packing to shipping via Logan Gravity Rollers. Lower right: Logan Live Rollers through packing room.

NUMBER, PLEASE! Ali Baba and his magic *Open Sesame* could never have swung the million enchanted gates to wealth and progress that Western Electric telephones are opening every hour. For Western Electric, through a program of economic production and distribution, has helped to place the telephone within reach of half the world . . . . And, by eliminating the waste of unnecessary labor and expediting movements throughout various phases of manufacture, Logan Conveyors are contributing an important share in this gigantic enterprise. What is preventing a more economic production and wider distribution of *your* product? Ask today for your copy of "Seven Economies of Logan Conveyors"—it will entail no obligations.



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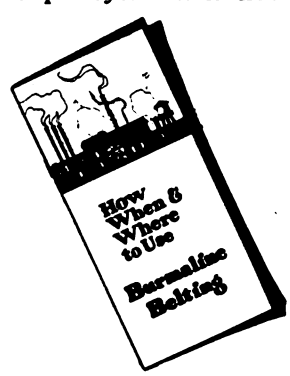
Year after year use proves that it possesses all of the good but eliminates all of the weak points of Solid Woven, High Grade Rubber, Leather, Balata or Stitched Canvas Belting.

In 1913 BURMALINE BELTING was put on the market and for 14 years, ***because of its inherent qualities,*** has been reducing power transmission costs in the biggest plants in the country where it has been under the strict surveillance of power transmission engineers.

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Great tensile strength. WILL NOT PULL CROOKED. Withstands heat, oil, dust and acid fumes. Adaptable to over 95% of all drives. Made in only one grade—SINGLE, LIGHT DOUBLE and DOUBLE—in continuous lengths with NO LAPS or SEAMS. Excellent suction on the pulleys. Will not deteriorate or harden with age in use or in stock. Takes any kind of belt lacing.

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A ready reference guide showing "Where to Buy" such cost saving equipment can be found on page 108.

Harvey Conover Jr.
Business Manager.

Industry Illustrated

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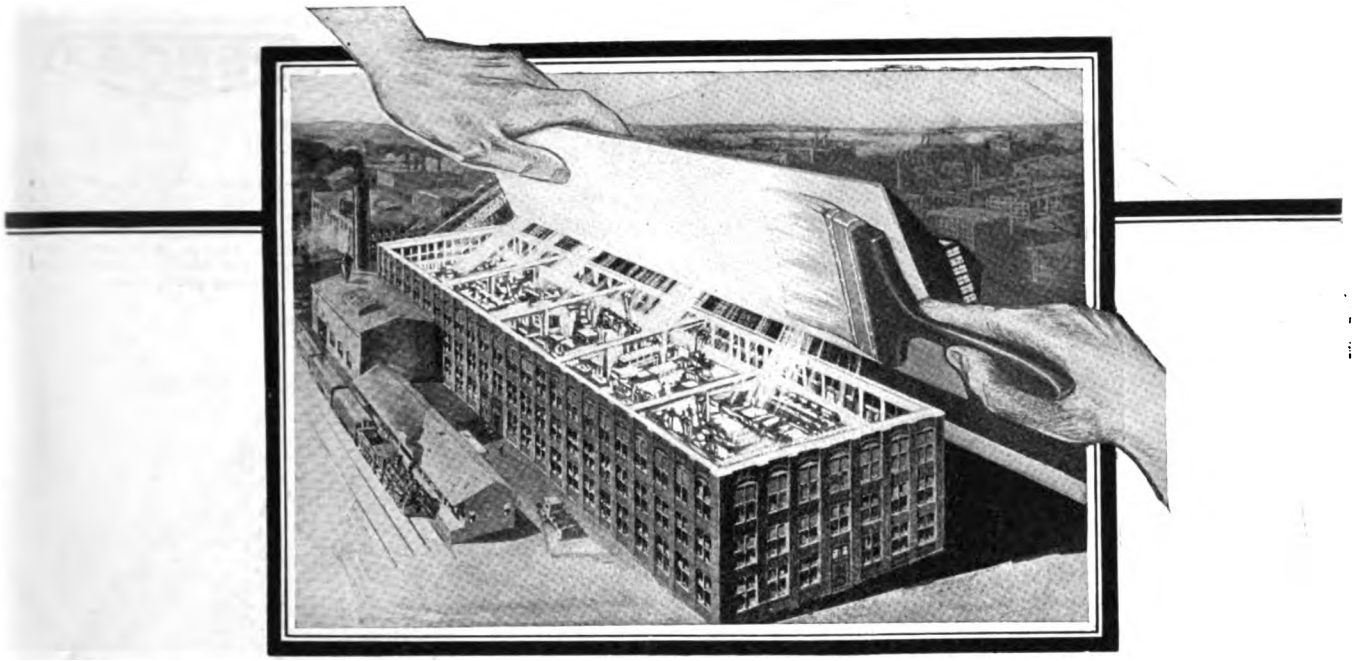
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250—*Moulders' Soft Brush. Made of Pure Black or Grey Horse hair—staple set. Length of hair 2⅞"—4 rows wide. Size of block 9" x 1⅛". Very convenient in shape and a long-wearing brush.*

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205—*Moulders' Soft Brush. Made of extra-long, stiff Pure Black Horse Hair—staple set. Length of hair 3½"—5 rows wide. Size of block 9⅞" x 2". Very popular with foundrymen for their efficiency and long-wearing qualities.*



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On this page are illustrated a few of the more popular Osborn foundry brushes—a catalog showing the complete line of Osborn Foundry Supplies and Equipment will gladly be sent on request.



204—*Moulders' Hard Brush. This is a very popular number because of the curved or rocker face and the extra heavy filling of pure horse hair. Exceptionally long wearing.*



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Industry Illustrated

Modern Methods and Equipment

For Mill, Shop & Factory

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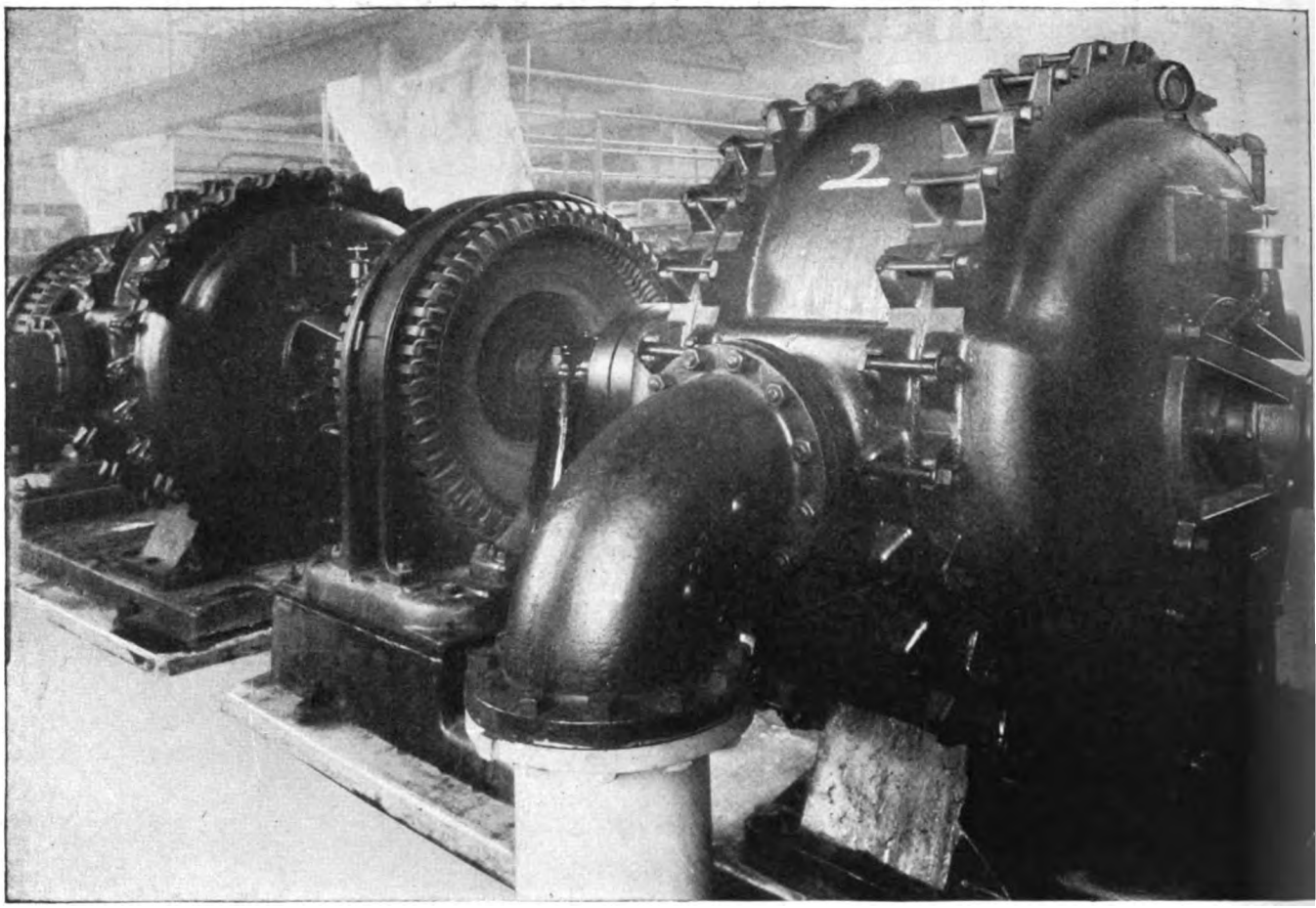
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Two of the four No. 8 Nash Hytor Vacuum Pumps used on the suction couches, in the Powell River Company plant. Each unit is designed for removing 1850 and 1710 cubic feet of air per minute, at 12 and 15 inch vacuum respectively. A fifth Nash Hytor, of the same type and size, is installed as a spare.

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On What Are You Basing This Year's Plans?

Some of the Factors Which Make 1927 a Year of Unparalleled Opportunity

THIS country has enjoyed many "boom periods," and has suffered the collapse of these booms, with their resulting periods of business depression. Is there anything different about the present era of prosperity; any reason to believe that it is more than a boom, and that the inevitable reaction is just around the corner?

Admittedly, this country is prosperous. Admittedly, we are much more prosperous, as a nation, than any other country in the world today. The first question, naturally, is whether business—in mapping out its course for the year—should count upon a continuance of good times, or whether it should prepare for a slump.

First, then, let us look at the country's natural re-

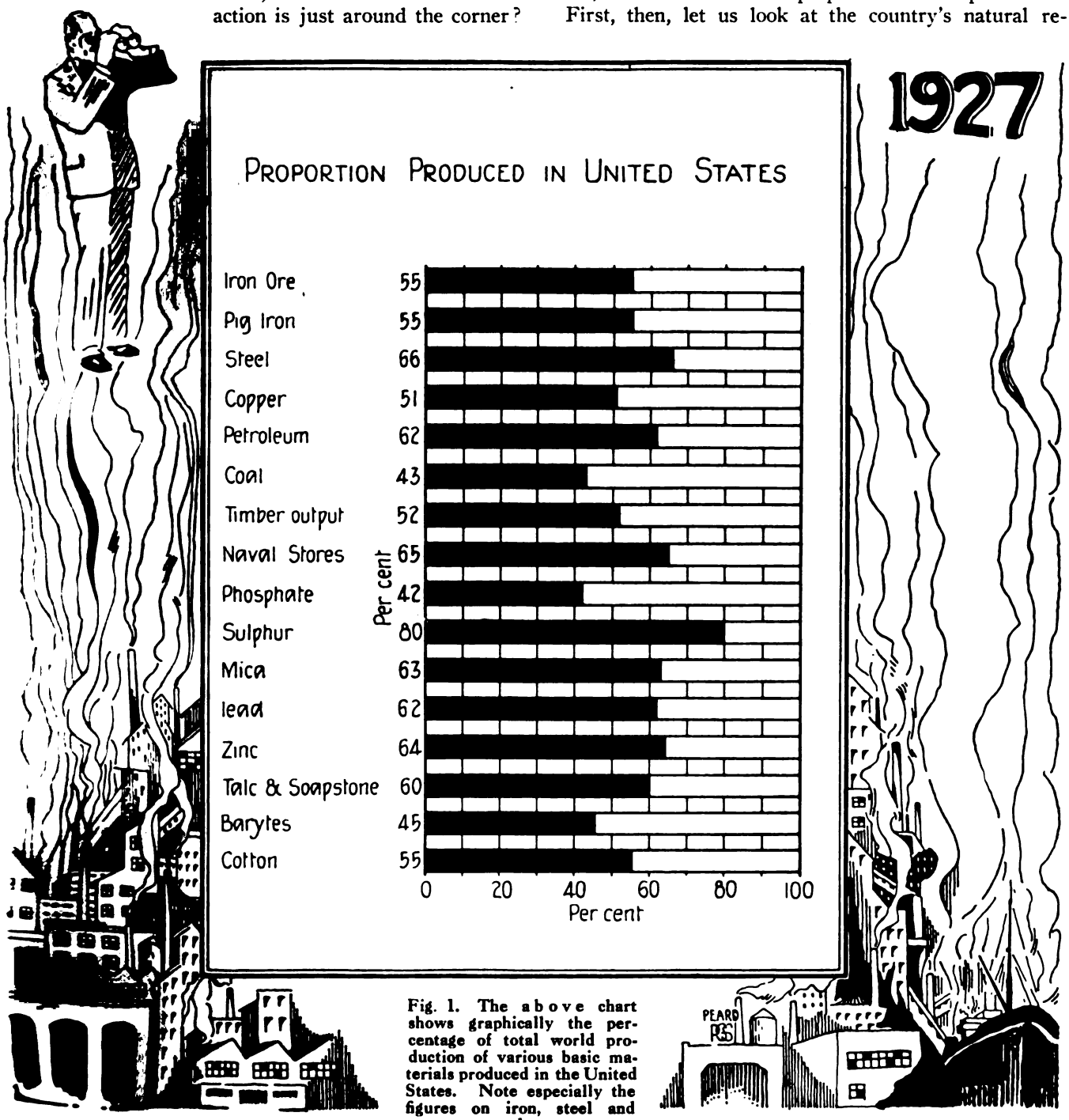


Fig. 1. The above chart shows graphically the percentage of total world production of various basic materials produced in the United States. Note especially the figures on iron, steel and petroleum.

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sources. Note (in Fig. 1) the list of raw materials used in industrial production. Of sixteen items, there are only three of which this country does not produce at least one-half of the total world production. With 43% of the world's coal production, 55% of its pig iron production, 66% of its steel production, and so on down the list, it would be a blind pessimist indeed who could say that we have no fundamental basis for continued prosperity.

In Fig. 7, note the three curves for wages, cost of living, and purchasing power of wages in this country over the past two decades. Not merely wages in dollars, but wages in the more real sense of purchasing power, have been steadily advancing. And when that happens, it can happen only through *increased production efficiency*. Wages, in dollars, can rise at any time; as they did, for example, during war days. But within a very short time, prices more than caught up; so that the purchasing power of these seemingly higher wages became actually less. What we are witnessing today is the maintenance of a generally high wage level without the accompaniment of higher prices; direct evidence that we have raised the productive efficiency of labor. Any country which can accomplish that, progressively and increasingly, is in a fair way to solving not only industrial problems, but social and economic problems of fundamental importance.

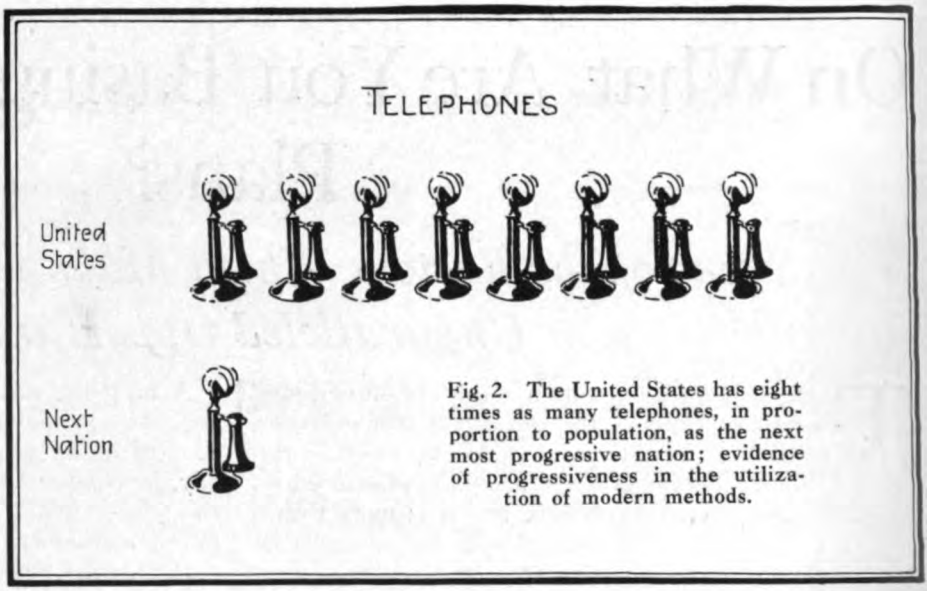


Fig. 2. The United States has eight times as many telephones, in proportion to population, as the next most progressive nation; evidence of progressiveness in the utilization of modern methods.

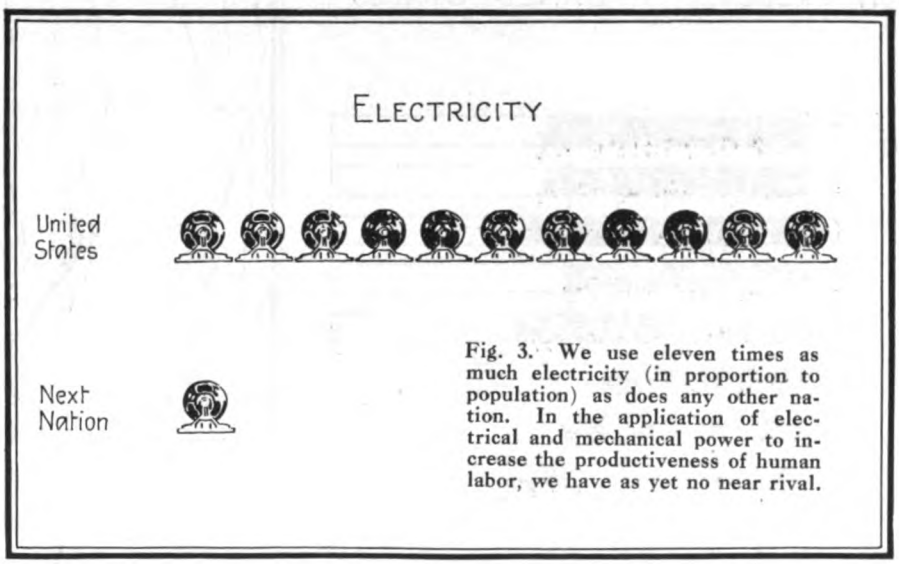


Fig. 3. We use eleven times as much electricity (in proportion to population) as does any other nation. In the application of electrical and mechanical power to increase the productiveness of human labor, we have as yet no near rival.

Here, then, are two basic reasons why confidence is the keynote for 1927. One of these, our wealth of natural resources, has always been with us, and has been the foundation for the industrial growth of this country. The other, the progressive increase in production efficiency per worker, has been recognized only in comparatively recent years. Its

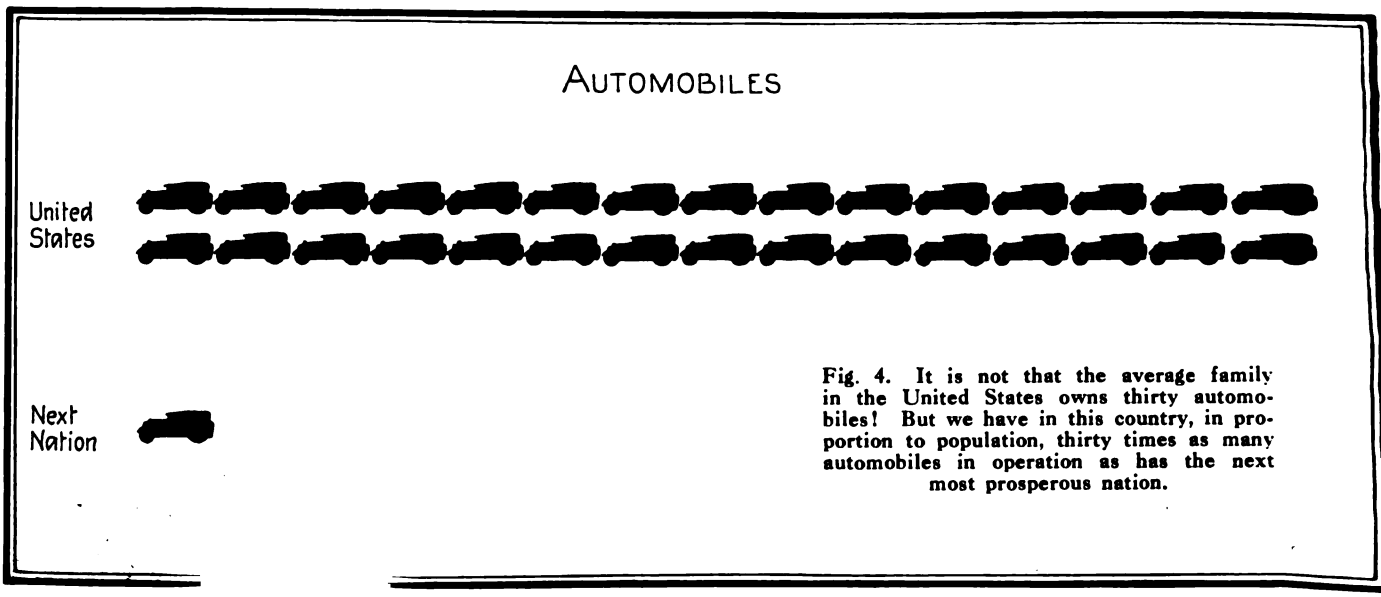


Fig. 4. It is not that the average family in the United States owns thirty automobiles! But we have in this country, in proportion to population, thirty times as many automobiles in operation as has the next most prosperous nation.

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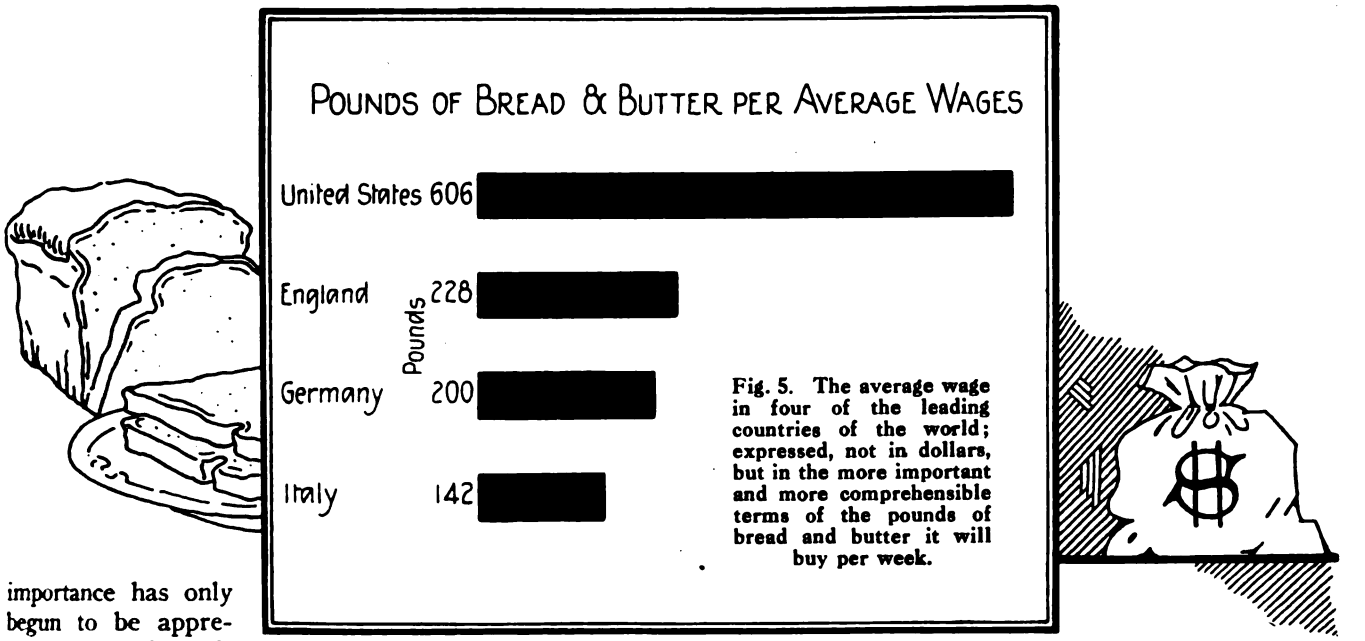


Fig. 5. The average wage in four of the leading countries of the world; expressed, not in dollars, but in the more important and more comprehensible terms of the pounds of bread and butter it will buy per week.

importance has only begun to be appreciated, and its effects are only beginning to be felt. That industry in general has only scratched the surface of the possibilities, is evident when we study (Fig. 6) what the outstandingly successful automotive industry has done in this respect.

It was a great financier of the last generation, who said, "Nobody but a fool would be a 'bear' on the prosperity of this country." He meant that it was impossible for any thinking man to doubt the fundamental soundness of the country's growth. That was true, then; but it is immeasurably more true today. And the man who bases his plans upon intelligent optimism, is the man who is going to make this year yield real results.

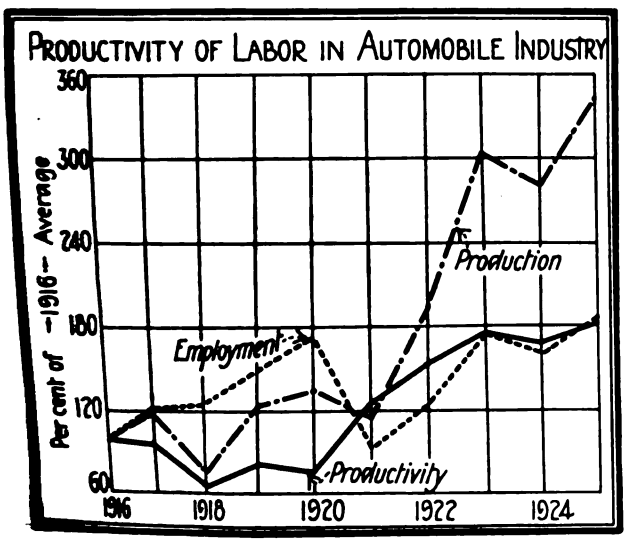


Fig. 6. Above—Note how the highly successful automotive industry has succeeded, by intelligent application of power and machinery, in multiplying the effectiveness of its human labor.

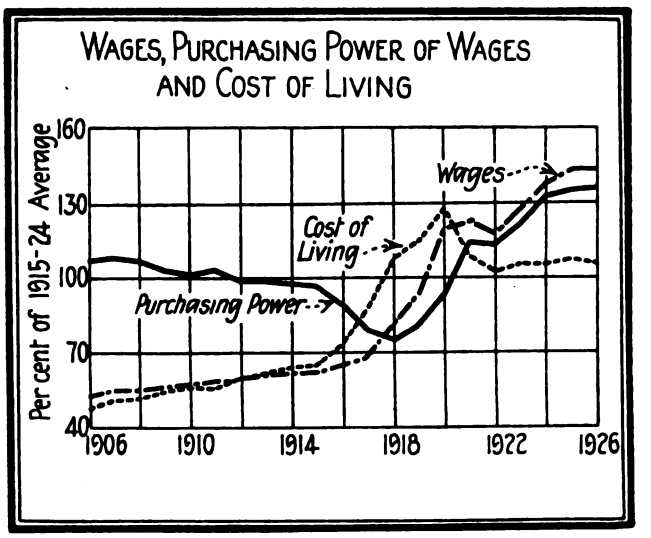


Fig. 7. Above—Note that, after the war, while the cost of living receded from its peak, wages continued upward; the purchasing power of wages therefore rising sharply. This was made possible only through increased productiveness of labor; a process that is still going on and that holds promise of almost unlimited results.

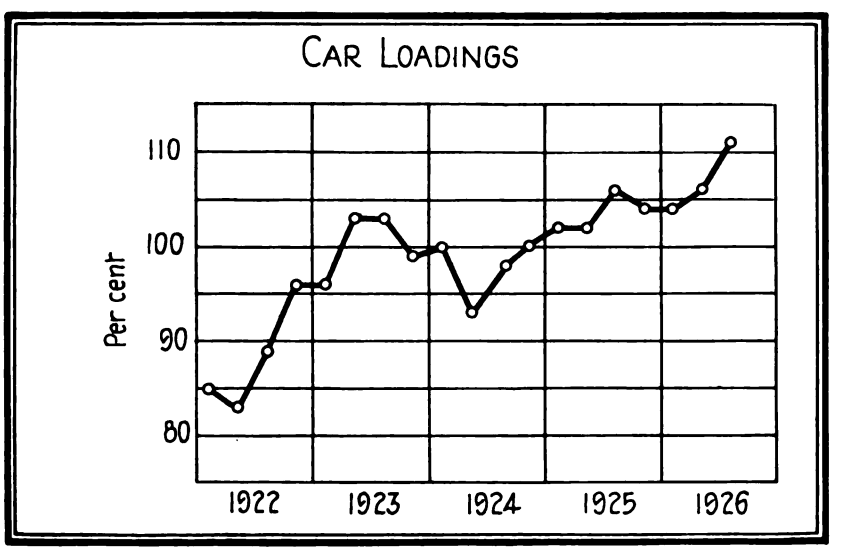


Fig. 8. At the right—Car loadings are accurate index of business activity. Note the steady upward trend, indicating a progressive increase in total volume of business.

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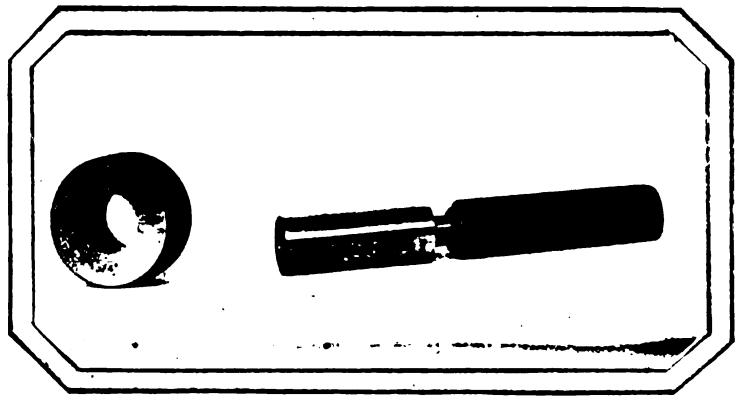
The Use and Care of Gages

By William W. Baxter

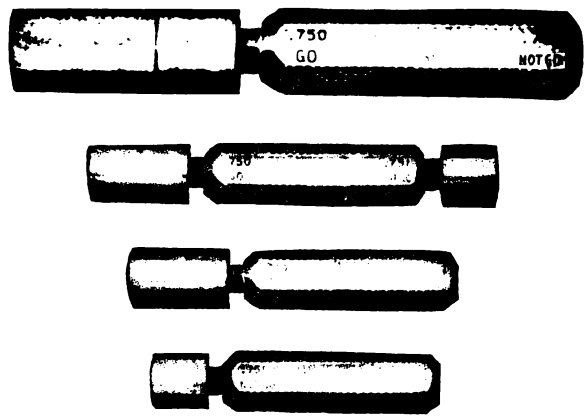
IT would be difficult today to name any metal article produced in quantity in whose manufacture gages of some sort do not play an important part. For, without adequate means to insure accurate duplication and interchangeability, the tremendous savings afforded by quantity production of parts would be more than lost on the assembly floor.

Gages insure this interchangeability. By their use it is not only possible to know that all parts manufactured in the plant will fit perfectly when assembled, but also it is possible to make parts in different factories, often widely separated, and know that when brought together every part will fit into place without undue effort.

The adoption of limit gages undoubtedly was one of the greatest forward strides industry has ever known. Limit gages insure the accuracy of the product within definite and permissible limits, and eliminate entirely the need of detailed measurement. Moreover, gages insure the needed accuracy without controversy or argument. They make for increased production and at the same time make possible better work with cheaper labor.

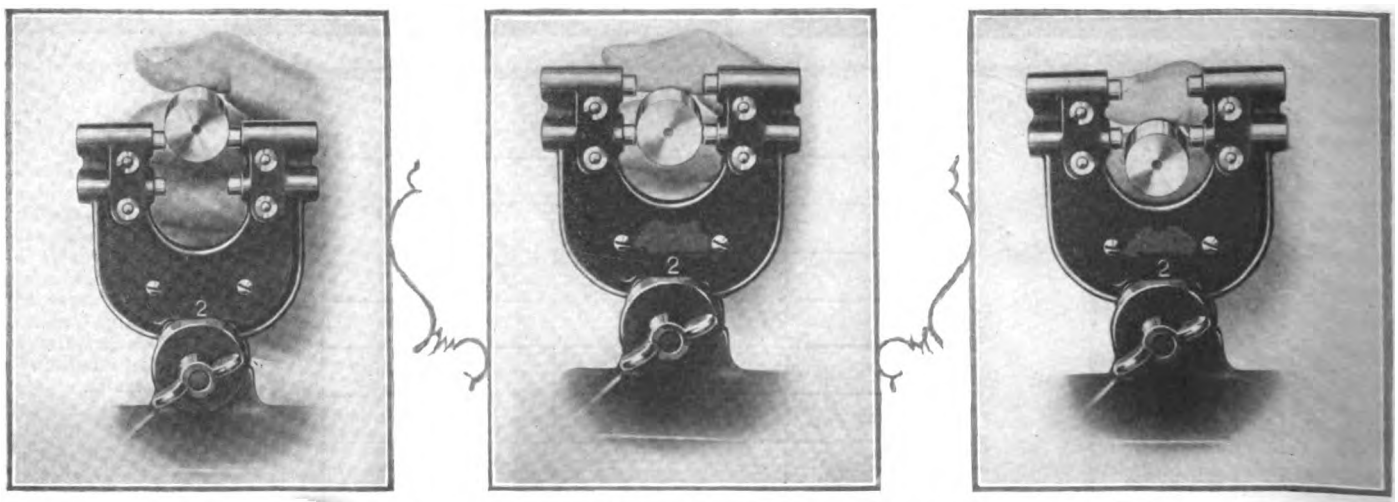


Standard plug and ring gages should be part of the equipment of every tool room. Their principal use is for reference and checking dimensions.



Limit gages check or control the permissible variation in the sizes of the product. These maximum and minimum permissible extremes of size are represented by "Go" and "Not Go" gages. Plug gages of this type are usually made in three styles; single end, double end, and single end progressive.

Practically everything produced in industry, and more especially parts of mechanical devices, lend themselves readily to inspection by gaging. For this reason, and because of a widely diversified number of products, gages of almost every conceivable type or form are to be had. Many of these are of special form, and are not manufactured commercially. Yet, for gaging internal and external diameters, lengths, and other similar dimensions there are a number of different types of gages available. These usually re-

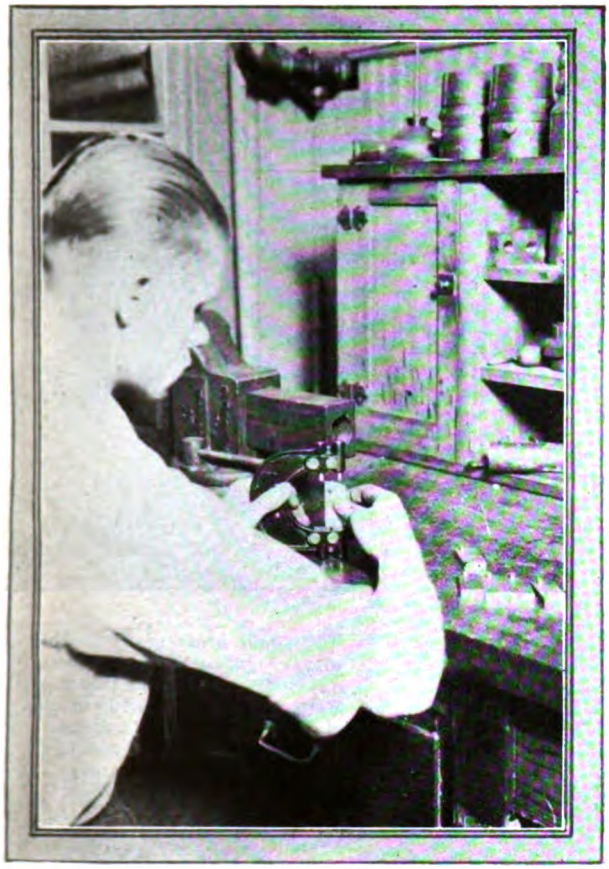


Limit snap gages are designed for rapidly inspecting duplicate parts. With one quick movement the gage accepts satisfactory work, and rejects over and undersize pieces. (Left) Too large. (Center) Just right. (Right) Too small.

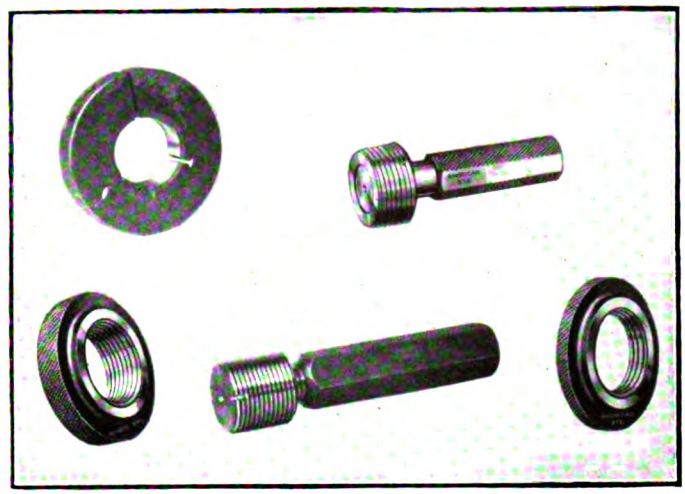
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solve themselves into two general classes; plug limit gages, and snap gages. Of these, too, there are several different classes.

It should be needless to state that gages are precision tools, and should be handled accordingly, but, on the other hand, possibly due to ignorance or carelessness, they are often badly abused. Care should be exercised to see that gages are properly marked and that adequate storage be provided. Never, at any time, should a part be forced into a gage, and under no circumstances should a plug or thread gage be forced into a part.



Rapid inspection limit snap gages speed up inspection by virtue of the solid lower jaw extending beyond the upper end of the gage and upon which projecting surface it is most convenient to locate and level the work before moving it toward the actual measuring anvils. This type of gage is very convenient for checking either diameters or lengths.

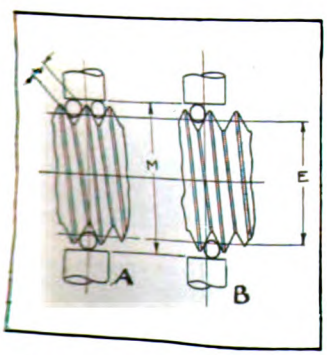


Above pipe threads are measured with gages similar to those used for inspecting screw threads. The illustration shows both plug and ring gages for inspecting both straight and taper threads.

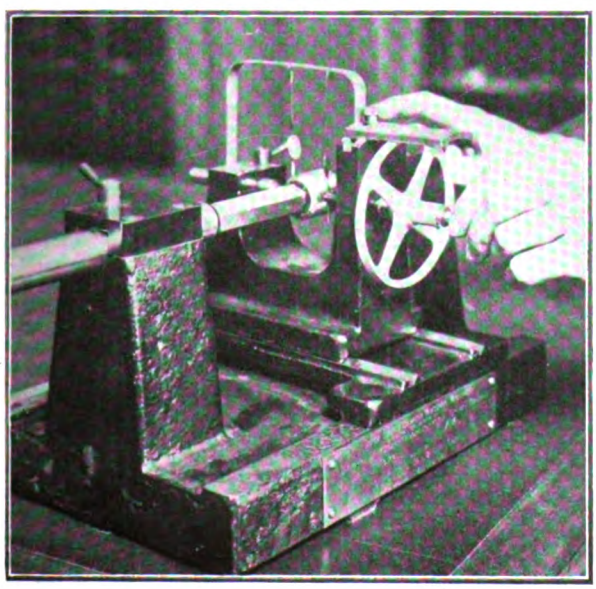


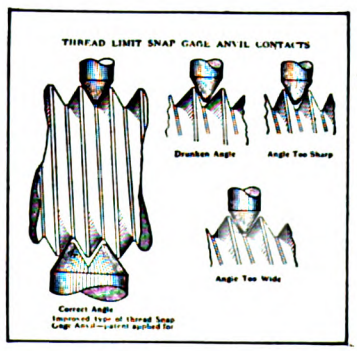
For measuring threads, either internal or external, there are several types of gages. These are usually divided as limit plug gages, ring gages, snap gages, and screw pitch gages.

Accurate measurements of screw threads may also be made in specially constructed devices using the well-known wire measurement method. These machines are ordinarily used for checking the accuracy of gages.



At present the most dependable and most universally recognized method of obtaining measurements of external threaded parts is by means of hard steel wires, made to a high degree of accuracy, and laid into the threads on opposite sides of a screw, as shown in Figs. A and B, the measurement being taken over the wires. A measurement so obtained bears a definite relation to the pitch diameter.



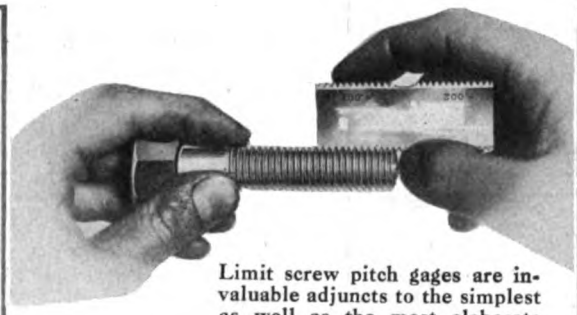


Snap gages for measuring screw threads often reveal some of these irregularities. The angle of the thread may be what is termed a "drunken angle," or the angle may be too sharp or too wide, all of which have a material bearing on the fit and accuracy of the thread.

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Always place an identification mark on every gage. A small brass plate is provided for this purpose, but the plate should always be removed from the gage for stenciling, as is shown at the right.



Limit screw pitch gages are invaluable adjuncts to the simplest as well as the most elaborate thread inspection systems. Lead errors in threaded parts are among the most common and most harmful thread defects, and the screw pitch gage will quickly and conveniently indicate their presence.



The small brass plate attached to snap gages for identification markings is shown in this illustration. It is attached by means of small brass screws and should be removed before stenciling, otherwise the gage may be damaged.



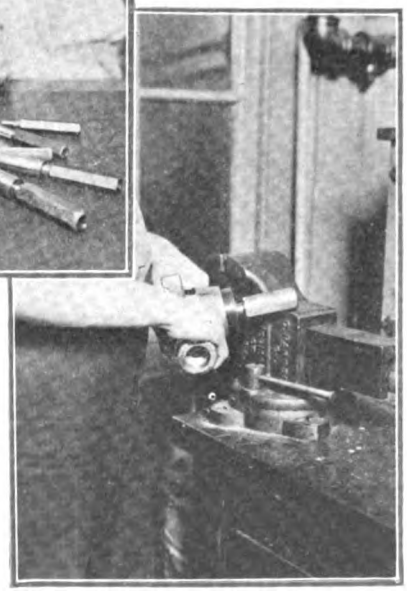
Place the small brass identification plate, found no snap gages, on a metal block or anvil for stenciling. It prevents damage to the gage.



Gages should be checked regularly for correct sizes. For this purpose "Checks" of the proper size should be part of the gage set.



Never permit an operator to force a piece into a gage in this manner. It does not give accurate inspection and it might damage the gage.



Never abuse a gage by striking it on a vise or by hammering. No gage should ever be forced ... the work so tight that it ...t be removed without undue effort.

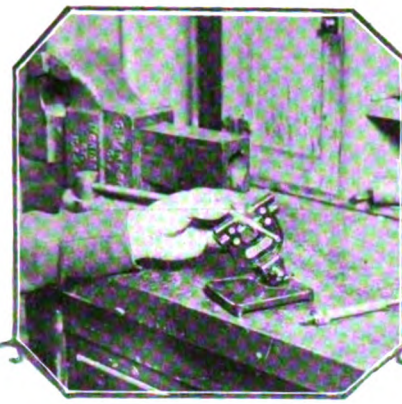


Screw thread gages may be had in almost any size and their judicious use insures absolute interchangeability of parts. The operation shows the use of a "Go" plug gage for measuring threads.

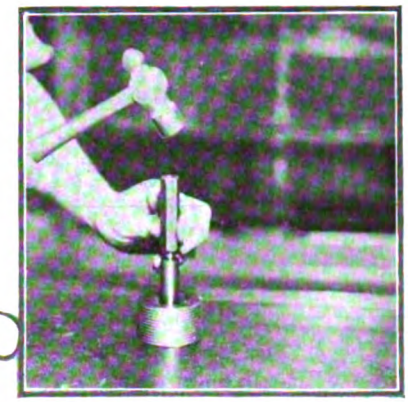
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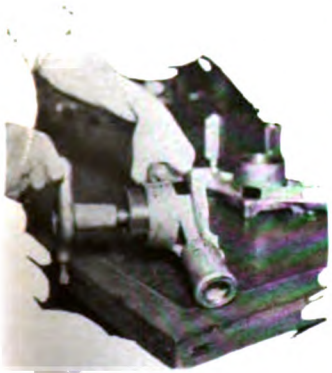
Single end progressive type plug gages speed up the inspection of small parts such as these. One movement of the operator's hand determines whether the piece is satisfactory or not.



Limit snap gages fitted with stands increase production and permit of accurate inspection. This type of gage is also shown on the first page of this article and is largely used for bench inspections.



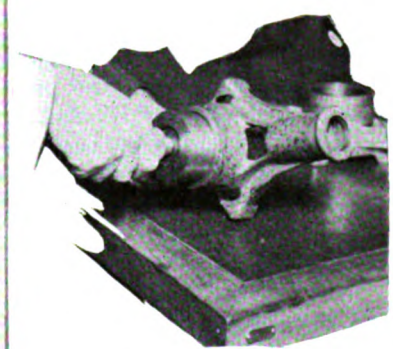
If the gage does not slip into the piece easily never attempt to force it. This procedure does not give accurate results and damages the gage. Moreover, it does not insure interchangeability of parts.



Don't permit the use of a lathe dog or wrench on the handle of a screw thread plug gage. It does not give an accurate measurement of the threads.



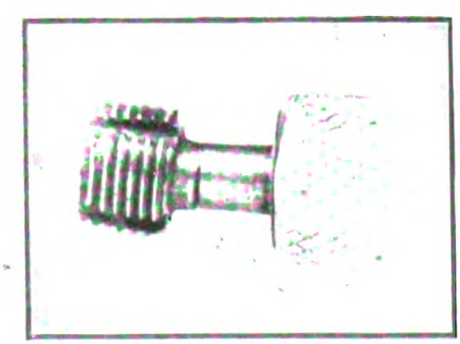
Double end plug limit gages determine accurately the sizes of small holes. These may be had in any size with any variation between maximum and minimum tolerance limits.



It pays to gage every finished surface of a product throughout the entire sequence of its production operations. Using a plain "Go" plug gage.



"Go" and "Not Go" ring gages permit of accurate measurement of external screw threads. As is the case with plug gages these may be had in any desired size.



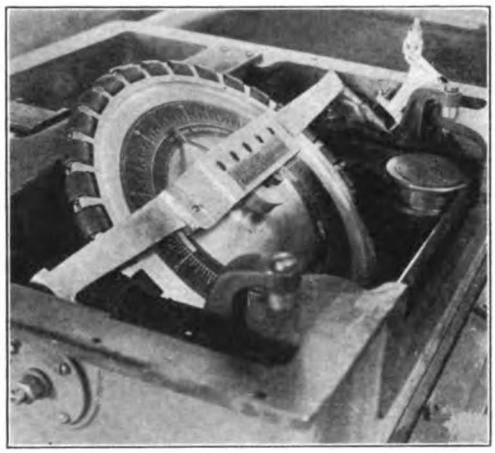
An example of what usually happens when a plug gage is forced into a part. Such practices should never be tolerated in any inspection or production department.

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Automatic Scale Weighs Conveyor Material During Transit

By George F. Paul

WITH the development of plants for handling bulk materials such as coal, cement, gravel and ores, there has come the need for an accurate device for weighing these materials while they are being handled by conveyors. As a result there has been developed a weightometer that is securely supported directly over the conveyor. A portion of the conveyor is released from its supports and suspended from the weightometer. The weight is the resultant of two forces: the speed of the conveyor and the load carried. The deflection of the floating platform caused by the load passing over the conveyor is instantly transmitted to the weigh beam and through it to a recording beam. The speed of the conveyor is communicated by means of sprockets to the recording disc belt in the integrator box.



An interior view of the integrator and recording mechanism of the weightometer showing details

The resultant, i. e., the weight of the load, is obtained by tilting the recording disc from its vertical plane, due to the deflection of the beam, and the pressure and movement of the recording disc belt on the rollers around the disc, rotating the disc.

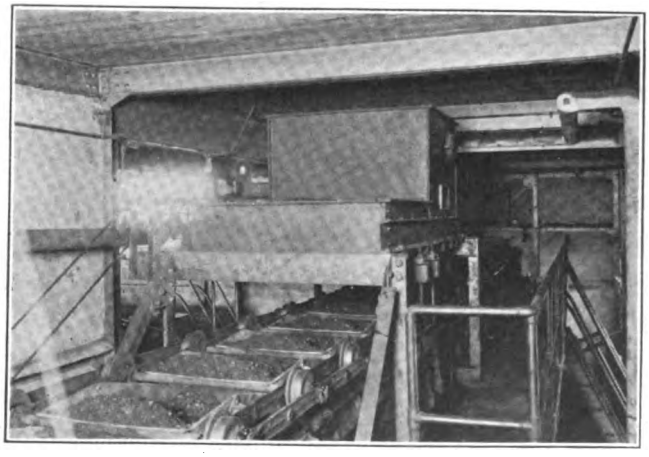
When the conveyor is running free, or without load, the recording disc is stationary and in a vertical position. The recording disc belt is always in a horizontal plane and presses on the rollers of the disc at two opposite points only; as long as the disc remains in the vertical plane, the belt merely rotates the rollers at the points of contact.

As soon as the material on the conveyor passes on to the floating platform, the deflection of the platform instantly acts on the frame carrying the recording disc; the disc is tipped and the belt acting on the rollers rotates the disc at a speed proportional to the angle of it. The speed of the disc belt is at a constant ratio to the speed of the conveyor and it is apparent that the greater the weight of the material, the greater will be the angle of the disc and consequently the faster it will rotate. Every time the recording disc makes a complete revolution it counts one in the unit counter and as the disc is graduated in decimals of the unit, it is a very easy matter to take the reading.

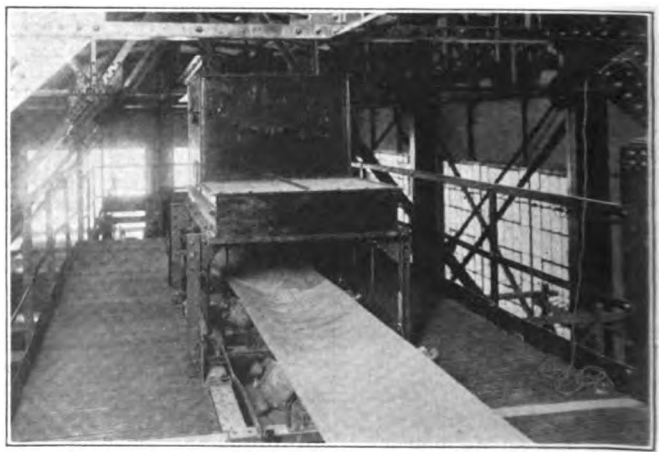
No weighman or attendant is required and the weights do not have to be taken by hand. Consequently, all chances of error due to the human element are removed. With the passing of the weighman goes the operating charge,—his wages.

No motor or generator or other outside attachments are necessary. The scale is shipped as a complete unit and to put it in operation all that is required is to install it over the conveyor under simple supports of either angle iron or timber, connect up to a small sprocket and the scale does the rest.

Many similar types of weighing equipment are now being used in industrial plants throughout the country, and in a large number of cases where it is necessary that several kinds of bulk materials should be mixed they are proving a valuable aid in securing the proper proportions of a mixture.

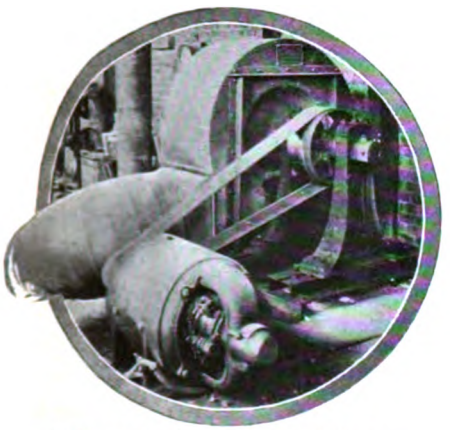


A weightometer operating with a bucket conveyor in a plant, weighing hot c



A weightometer installation with a belt conveyor used for weighing coal in a large tin plate plant.

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High-speed direct-connected fan.—This centrifugal fan is connected to a variable-speed direct-current motor and is capable of developing 1,600 cubic feet a minute at 2.2 inches water gage for foundry service.

Interesting Types of Industrial Fan Installations

By George Lee

FANS and blowers always have played a major part in the programs of industry but with the recent introduction of new manufacturing and material-treating processes they are now about to become still more important elements. Some of the latest applications of air, requiring both large and small fans and blowers are new types of underfeed stokers, air flotation methods for treating ores and fuels, and air conditioning systems for the ventilating machines and cooling or refrigerating buildings, offices, hotels, theaters, etc.

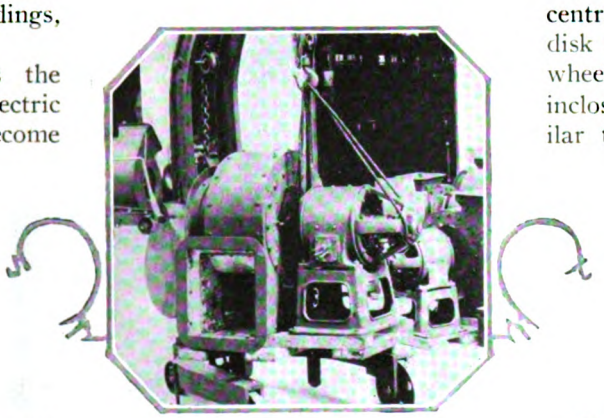
With these additional uses the problem of properly applying electric drives to air equipment has become more involved. In some instances, the necessity for quiet operation is paramount, in others variable speed control reliability and high economy are the dominant factors.

Electrically driven air-handling devices cannot be employed successfully without some knowledge and experience in the application of electric motors. A fan provided with a motor too small is almost always a troublesome installation and a hazard. If it does not permit the fan to deliver its full capacity of air when needed it is unsatisfactory. If it is noisy or inefficient its vibration is a disturbing element and its power cost is even more so.

In applying motors to fans it is essential to understand the simple fundamentals of fans before attempting to select the proper motor.

Fans are of two general classes: centrifugal fans, and propeller or disk fans. The centrifugal fan is a wheel with a large number of blades, inclosed in a snail-shell housing, similar to that of a centrifugal pump. Air enters or is exhausted through either one or both sides around the shaft, depending upon whether the fan be of the blowing or exhausting type. Propeller fans usually consist of four or six blades which revolve in a wall ring.

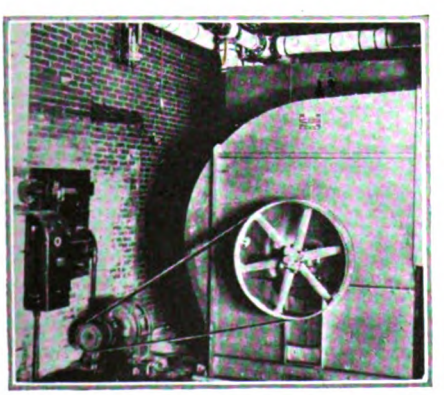
There are so many variations in these different types of fans that it is sometimes bewildering to determine the exact classification of each.



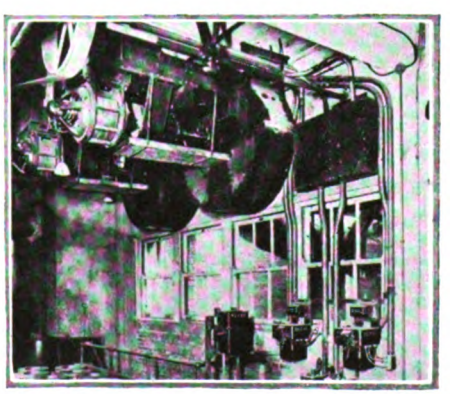
A type for the foundry—The function of this small centrifugal fan is to develop uniform draft. It is driven by an adjustable-speed direct-current motor.



Squirrel-cage induction motor drive—Here is a simple application for constant-speed service on an exhauster for handling saw dust and shavings in a mill.

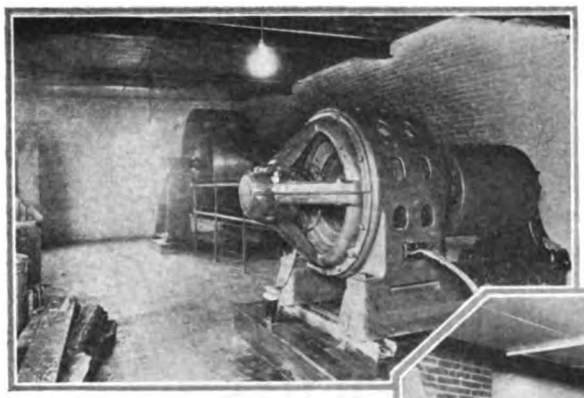


Heating and ventilating blower—A small alternating-current fan motor drive complete with compensator starter mounted near the motor.

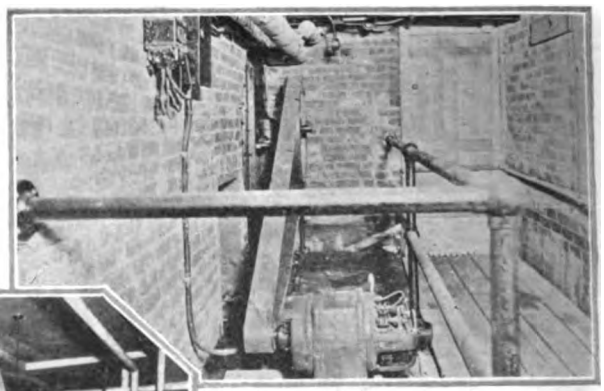


Ceiling mounted motor—Note that these motors may be operated at various speeds with secondary resistance control by means of the drum controllers.

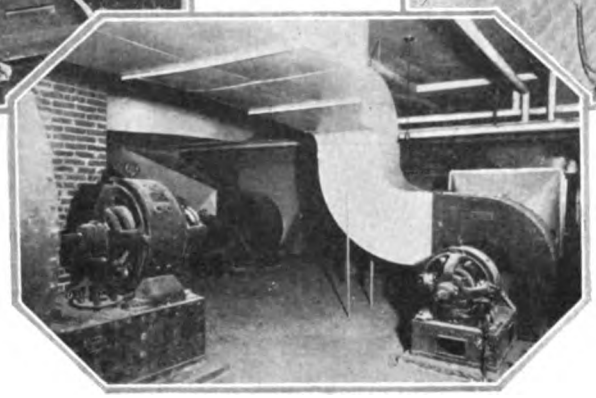
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Slip-ring induction motor fan drive—A 250-hp. fan motor with 25 per cent. speed variation.

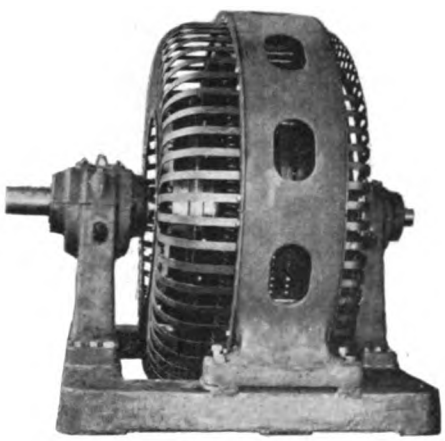


Single-phase brush-shifting motor—The speed of this motor is varied by changing the brush position.



Two ventilating units—These direct-current motors driving ventilating fans are located in a hotel building. Frequently, direct-current motors are used in this service because they operate quietly and their speed is more easily regulated to suit requirements.

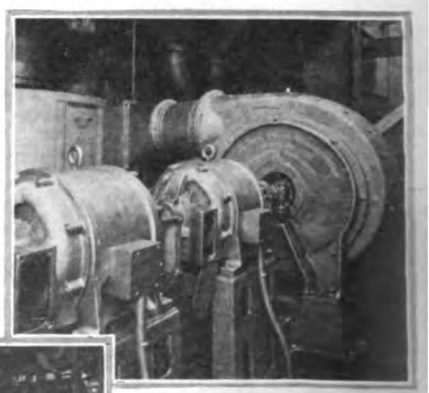
An unusual installation of a centrifugal type fan—This unit is set high in the substation room of the United Railways, of St. Louis, Mo., to keep the room cooler and thus enable the 2,000-kw. synchronous converter to operate at its full capacity without undue heating.



Late type synchronous motor—This clutch type synchronous motor is finding wide application for fan drives. The clutch is built inside the frame thus making the complete unit compact and simple.

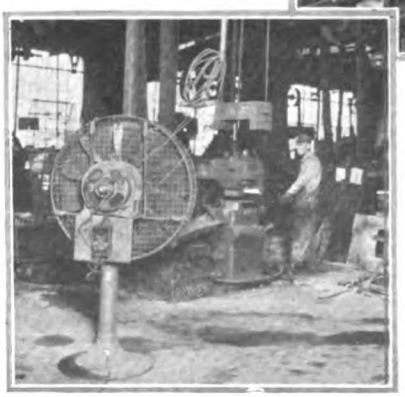
Tube-ventilated fan motors—Two enclosed-type squirrel-cage induction motors with ventilation tube connections. These connection outlets and inlets make possible the use of these motors in dusty warm places without clogging or undue heating.





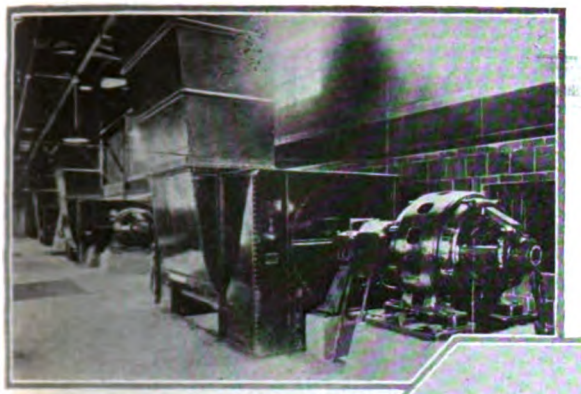


Fans in charcoal mill—High-speed centrifugal fans and air washers driven by enclosed-type direct-connected motors. Note the covers with peep holes in the end frames so that the operation of the brushes can be observed.

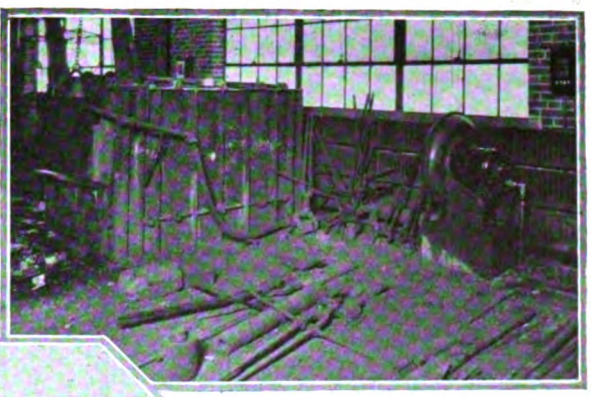


Semi-portable Blower unit—Propeller-type man-cooling fan of the portable type driven by a self-starting induction motor in the American Car & Foundry Plant at Detroit.

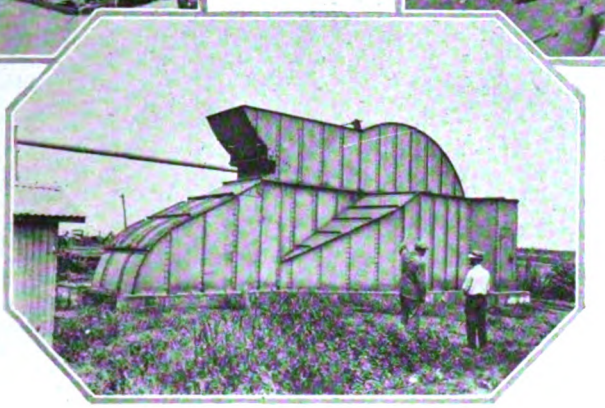
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Power plant draft fans—Induced - draft, centrifugal-type fans direct connected to slip-ring induction motors. The size of these fans necessitates this type motor for a smooth starting characteristic.



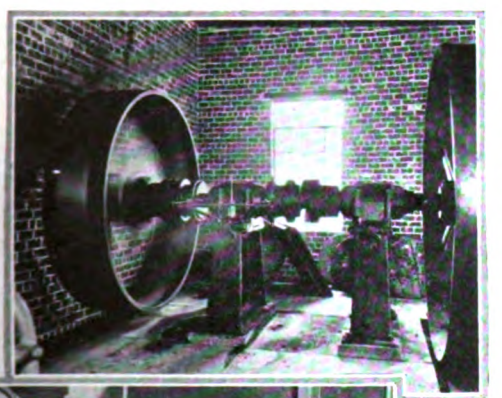
Common type industrial blower—A forge blower supplying air to two small forging furnaces. The motor is mounted on the frame of the centrifugal blower and is started from a remote control switch.

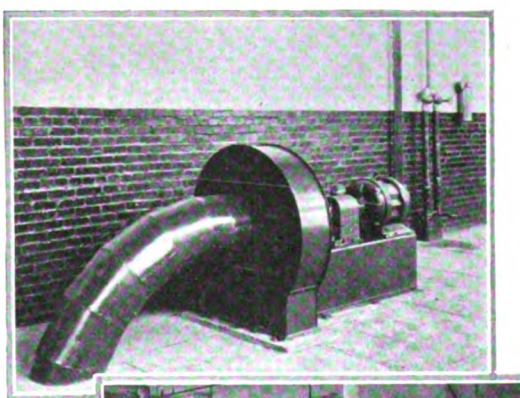


Large mine ventilating fan—Twelve-foot double-inlet blowing reversible centrifugal fan arranged for direct-connected drive. The normal capacity of the mine fan is 300,000 cu. ft. at 3-in. water gage.

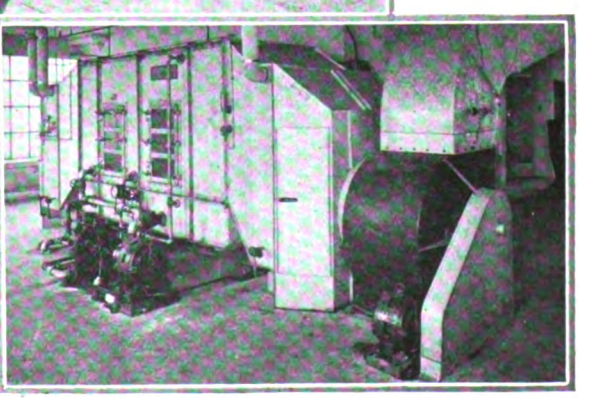
Powered from two motors—Jaw clutch arrangement for auxiliary drive to assure continuous operation of an important mine ventilating fan.

Air for steel mill—Ventilating air is supplied to steel mill motors from this blower. The driving motor is a simple squirrel-cage unit.





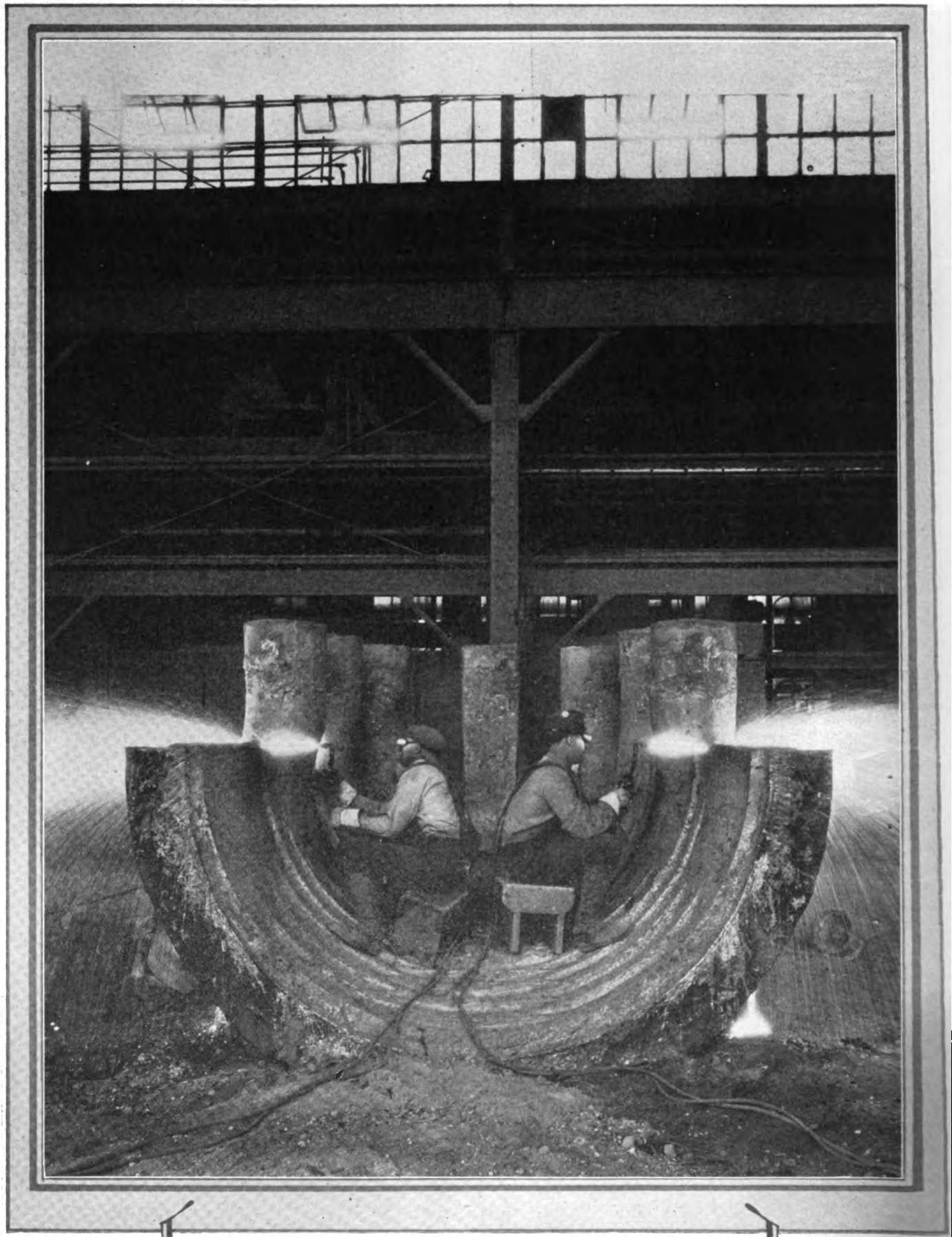




Direct-current driven steel plate fan—This steel-plate blower is used as a part of the heating and ventilating system of the Springfield municipal building, Springfield, Mass.

Air washing blower—The fan in this air washing system is a centrifugal unit driven through a chain drive connected to a small alternating-current motor.

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Since the adoption of illuminating gas to replace acetylene, hydrogen and other fuel gases in combination with oxygen for metal cutting, many valuable uses have been found for this new metal cutting tool. The accompanying photograph shows two operators cutting risers from a steel casting with oxy-illuminating gas By this method a 19-inch steel riser is cut through in 7½ minutes.

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The Holding Power of Wood Screws

Accurate Data Now Available Derived From Over 10,000 Tests in Seven Kinds of Wood

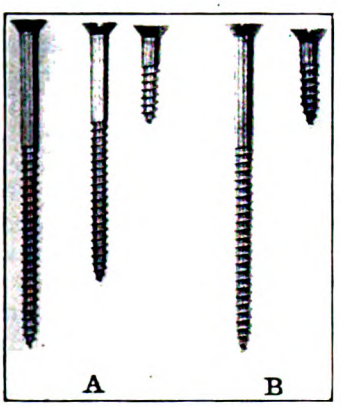
By I. J. Fairchild

Department of Commerce, Bureau of Standards

DID you ever stop to think that often but little accurate information is available about certain properties of articles in common use? Some things are so commonplace and have been in use so long that we are apt to assume that nothing new is to be found out about them.

Take the case of wood screws. What is the holding power of a wood screw? How many pounds of force will be required to pull a wood screw of a given size out of some particular kind of wood? Industries that use wood screws have often asked these questions, but no one could give a satisfactory reply. To answer them correctly would require a great many tests, because there are many kinds and sizes of screws, many different kinds of wood, and numerous procedures for inserting the screws.

In an attempt to answer these questions the Bureau of Standards of the Department of Commerce has conducted tests of the holding power of over 10,000 wood screws of various sizes, in seven different kinds of woods—yellow poplar, cypress, sycamore, Georgie pine, North Carolina pine, hard maple and white oak. The effect of various factors on the holding power, such as the use of a lead hole, and of a lubricant, have also been studied. It is believed that accurate data, probably the first of its kind on this important subject, has been secured as a result of this work.



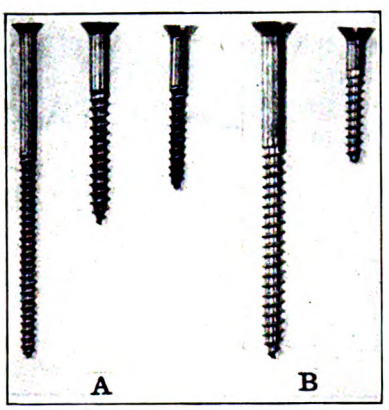


Fig. 1, left, and Fig. 2, right, illustrate types of screws used in tests.

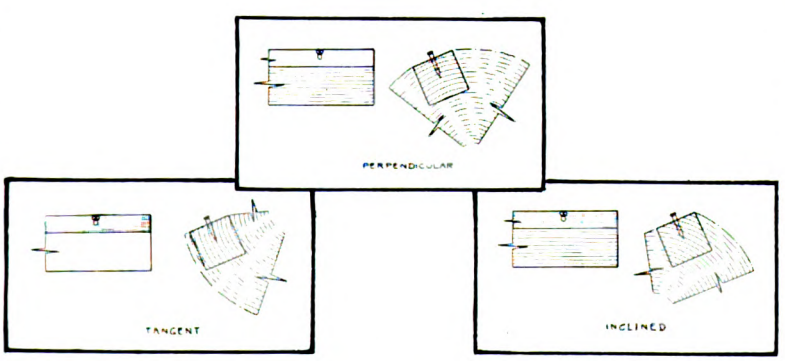


Fig. 3. Presentation of screw to grain of wood.

All the data obtained from these tests has been published by the Government in one of the technologic papers of the Bureau of Standards, part of which is abstracted herewith.

Scope of the Tests

This investigation was undertaken in re-



Fig. 4. View of testing machine with a timber containing large-size screws in place for testing.

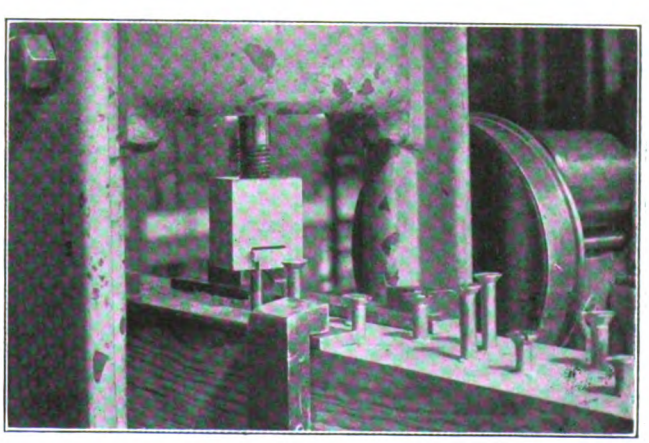


Fig. 5. Close-up of the test piece shown in Fig. 4, showing upper end of lugs and the method of gripping the screws.

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sponse to specific requests for data on the holding power of wood screws in the application of builders' hardware, and for the benefit of manufacturers of furniture, fixtures, vehicles, freight cars, ships, pianos, woodenware, boxes and crates, and other users of wood screws.

"Holding power" is here defined as the maximum load in tension which a given screw can withstand when the load is applied to the head of the screw along its axis. The load may reach its maximum limit either (a) through the withdrawal of the screw from the wood, or (b) in the denser woods through the breaking of the screw by fracture at the root of a thread near the shank, or (c) by collapse of the head of the screw.

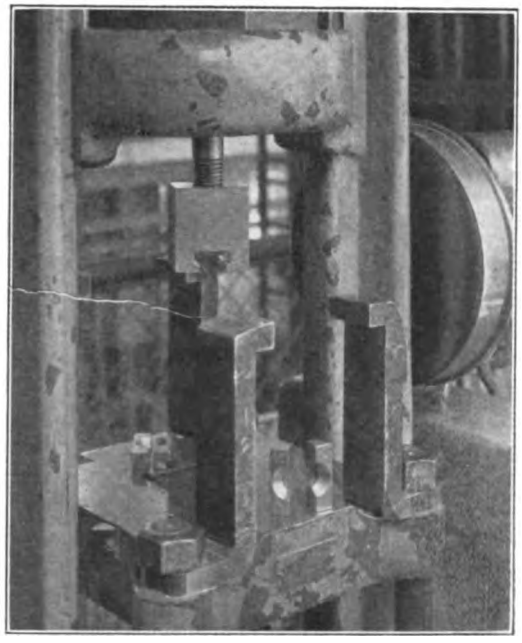


Fig. 6. Lugs, grips and holder of the test machine with the timber removed.

Since over 80 per cent. of the wood screws manufactured are of steel with flat heads, the tests were confined to this type. Ninety-five sizes were used, including every standard diameter from the smallest to the largest, in one-half of all the standard lengths. Seven different kinds of wood were employed, covering the full range of densities from the softest to the hardest woods in common use, in order to obtain the complete range of maximum direct tensional loads which wood screws are capable of supporting.

Description of Materials Used

Flat-head wood screws were used, comprising all of the diameters in one-half the lengths now manufactured. These ranged in size from No. 0, ¼ inch in length, to No. 24, 5 inches long. These screws, totaling 100 gross, were supplied by twelve different manufacturers, so that the screws are representative of the product of the industry.

The screws were found to conform with United States Government Master Specification No. 52 for wood screws, except that in a few instances the body diameter slightly exceeded the maximum plus tolerance. A wide variety of thread shapes was found, ranging from thin and sharp, as at A, Fig. 1, to thick and dull, as at B, Fig. 1, with the shape

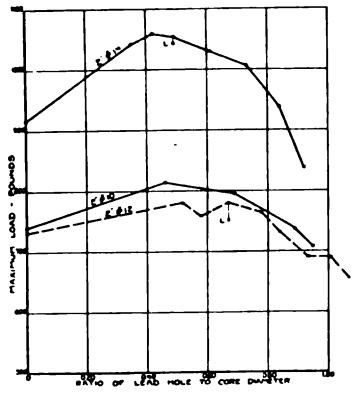


Fig. 7. Determination of head-hole size in poplar.

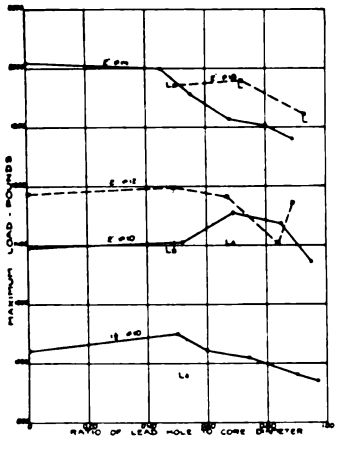


Fig. 8. Determination of head-hole size in oak.

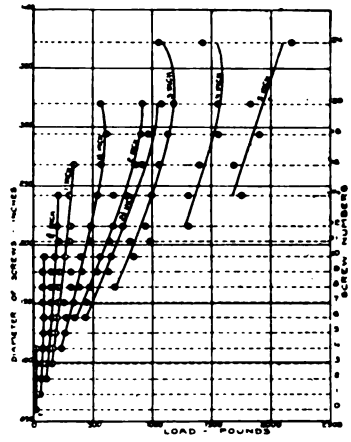


Fig. 9. Holding power of screws in cypress, side grain.

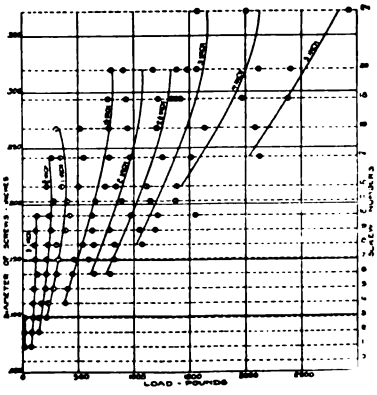
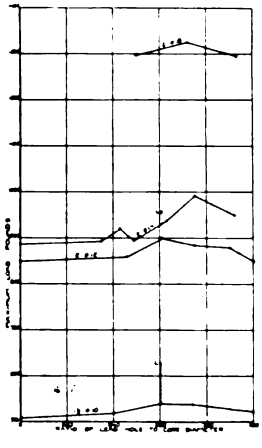


Fig. 10. Holding power i low poplar, side gra



11. Determination of lead-ole size in sycamore.

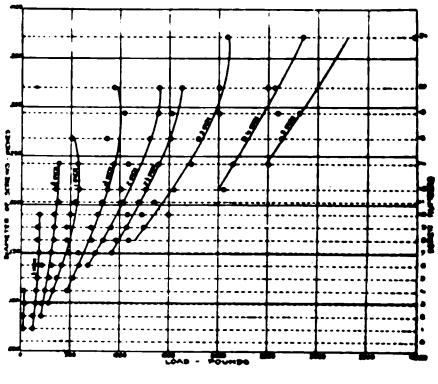


Fig. 12. Holding power of screws in sycamore, side grain.

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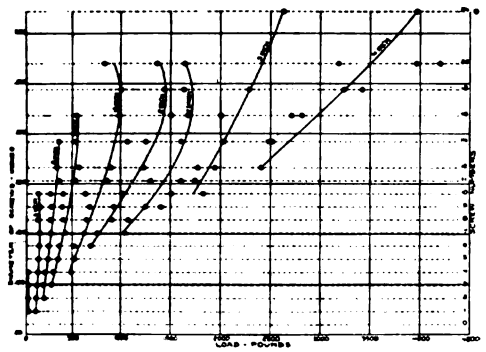


Fig. 13. Holding power of screws in North Carolina pine, side grain.

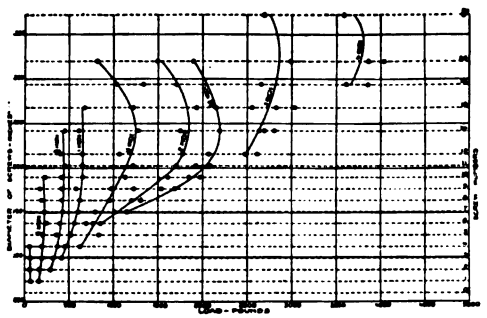
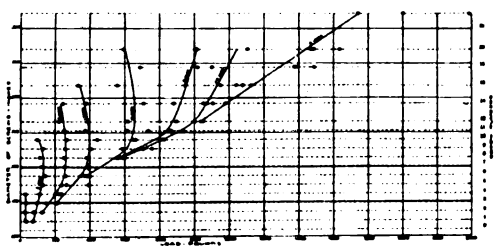


Fig. 14. Holding power of screws in Georgia pine, side grain.



Fig. 15, left, holding power of screws in white oak, side grain.

Fig. 16, right, holding power of screws in hard maple, side grain.



at the root of thread varying from conical, as at A, Fig. 2, to cylindrical, as at B, Fig. 2. The finish or texture of the metal at the surface of the body and threads also varied from a high polish to a coarse, rough texture.

Timbers

Seven kinds of wood were used. The timbers were 3¾ by 3¾ inches in cross section, and 6 feet long. These dimensions were convenient for easy handling and permitted the insertion of small screws in each of the four sides, thus conserving lumber and obviating the need for more than one set of holding lugs.

Immediately following the tests on each variety of wood a sample was submitted to the chemistry division for determination of moisture content and density.

Lead-Hole Size

It was first necessary to determine the most efficient size of lead hole for a given size of screw. For these preliminary tests certain popular sizes of wood screws were selected, including 1½-inch No. 10, 2-inch No. 12, 2-inch No. 14, and 2-inch No. 18. The drill sizes varied from 40 to 100 per cent. of the core diameter of the screw. Readings were also taken for each size with no lead hole, the screws being forced in the required depth with a power screw driver. Ten screws were inserted for each condition of test, and the values given represent in each instance the average of ten determinations.

All screws, except the very small sizes, were inserted with special screw drivers in a drill press. This was done to expedite the work and presumably gives results comparable with insertion by a manually operated screw driver. This method makes it possible to insert screws which could not be driven by hand, such as a heavy screw in oak without a lead hole or with a small lead hole. There is, however, an inherent limit of torsional stress, which the screw heads will withstand which serves to prevent the adoption of too small a lead hole. All screws were inserted to a depth of three-fourths the nominal length.

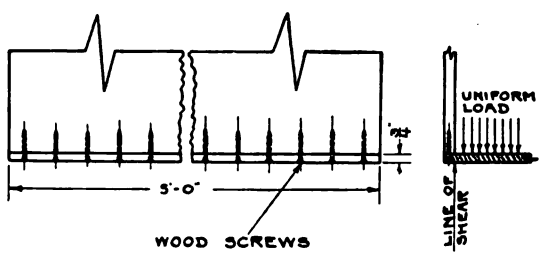


Fig. 17. Method for determining number of screws required to produce a perfect joint.

The effect of various lead-hole diameters on the holding power is illustrated in Figs. 7, 8, and 11.

A frequent practice among carpenters and cabinet-makers is to select a lead-hole drill diameter equal to the core or root diameter of the screw. The results of the above test all indicate that this practice should be discontinued whenever anything approaching the maximum efficiency of the screw is desired. It is recognized that in certain hardwoods, it is almost impossible to insert a screw with a small lead hole, say 50 to 70 per cent. of the core diameter. In such cases it is recommended that a lead hole of approximately 90 per cent. of the core diameter be employed, using soap or other lubricant if necessary to permit insertion of the screw.

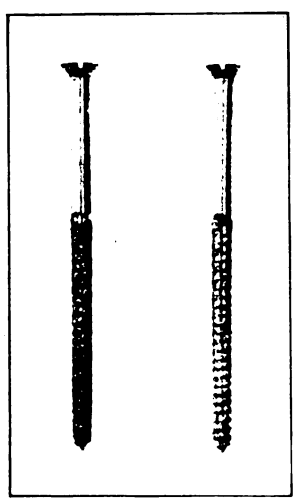


Fig. 18. Screws withdrawn from end grain of cypress, showing wood fibers adhering to threads.

A study of the foregoing results and of the conditions relating to the insertion of

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screws led to the adoption of a lead hole of 70 per cent. of the core diameter throughout the remainder of the tests, except in the case of the very hard woods, where a 90 per cent. lead hole was employed for the larger sizes of screws.

Lubrication

A few of the tests for determination of lead-hole size were repeated under the same conditions, except that white soap was used as a lubricant. A comparison of the values thus obtained indicates the results which may be expected from the use of lubricant on screws.

In Figs. 7, 8 and 11 those points marked with L indicate loads obtained from screws lubricated with white soap. The lead holes were drilled in the usual manner and soap applied to the screw threads by wiping the screw across the soap.

It is believed that users of wood screws need have no hesitancy in applying a lubricant to screws when necessary to facilitate insertion.

No attempt was made to determine the weakening effect, if any, of the lubricant upon the holding power of screws when withdrawal is delayed for months or years. All screws were withdrawn within one or two days after insertion.

Side Grain

Following the determination of the proper lead-hole size and the effect of lubrication, about 6,650 screws were inserted and withdrawn from the side grain of the seven varieties of wood mentioned. Ten screws of each diameter and length were used in each wood in order to obtain reliable average values of holding power. Results for individual screws seldom ranged more than 5 to 10 per cent. from the average values. Lead holes equal to either 70 or 90 per cent. of the core diameter were drilled in each case according to the kind of wood and diameter of screw.

The average results are also shown graphically in Figs. 9, 10, 12, 13, 14, 15, and 16. The ordinates are screw diameters with an additional scale to show screw numbers, while the loads are taken as abscissas. Points indicating screws of the same length are connected to form curves.

The results of this analysis may be stated briefly as follows: For a given length of screw, axially loaded, the holding power increases with the diameter up to a certain limit, beyond which an increase in diameter results in a decrease in holding power. Many standard-size screws lie beyond this dividing line.

In general, according to our observation, most furniture, boxes, and other articles manufactured from wood fail, if at all, at the joints. With the aid of the data here presented it would seem entirely practicable under certain conditions to select a size and quantity of wood screws to produce a joint of equal or greater strength than the adjacent wood. If the ultimate strength of the steel used in screws is assumed to be 50,000 lbs. per sq. in. and the wood is assumed in shear with the grain with a corresponding ultimate strength when green of from 561 to 1,990 lbs. per sq. in. (strength when dry 50 per cent. greater), it can easily be shown that the total cross-sectional area of the wood supported, provided that conditions permit the use of screws of such length as to develop the full strength of the m

In view of the rapidly incr wood and the attendant necessity for greater conservation in contrast to the low cost of wood screws, it is believed that the use of a much greater number of wood screws for a given joint than is now common practice is both warranted and advisable.

End Grain

After completing the side-grain tests additional timbers were cut into 3¼-inch lengths with a machine saw to insure proper alignment of the surfaces. Five screws of each size were used for each end-grain condition, but not necessarily in the same block, as in many instances not more than two screws could be inserted in a given block without having a tendency to split the wood. No effort was made to determine the limiting conditions for splitting the wood, although record was kept of all instances where splitting occurred.

The end-grain condition seems to produce more erratic results than any of the side-grain conditions. It is believed this is due largely to the tendency of the screw to split the wood. Owing to the rather irregular results obtained from the end grain, no curves are given for this condition.

Screw Design

No screws failed by shearing or other deformation of the threads. This indicates that manufacturers need have no fear of making the threads thin and sharp, particularly as this seems to increase the holding power.

Screws having a thread surface of rough texture appear to have a greater holding power than those which are highly polished. It follows, therefore, that a high polish is unnecessary and is a source of avoidable waste, if not altogether inadvisable.

Many screws failed by the two halves of the head breaking into the slot. In each case this seemed to be caused by an excessive depth of slot. It is suggested that the depth of slot be controlled within rather narrow limits, preferably with no depth of slot greater than half the height of the head.

In general, the screws seemed to be very well designed, and it is quite remarkable that the weak sections were so evenly divided between the upper end of the thread and the bottom of the head, particularly in consideration of the number of manufacturers represented.

General Summary

Tensional tests on over 10,000 wood screws in seven kinds of wood indicate the following general summary of conditions conclusively contributing toward maximum holding power:

(a) In softwoods the size of the lead hole is important and should be about 70 per cent. of the core or root diameter of the screw.

(b) In hardwoods the lead hole should be about 90 per cent. of the core diameter of the screw.

A lubricant, such as soap, may be used where necessary for easy insertion without any great loss in holding power.

For a given length of screw, axially loaded, the holding power increases with the diameter to a certain limit, beyond which an increase in diameter decreases the holding power.

For a given diameter of screw, axially loaded, the holding power increases with the length to the limit in hardwoods, where the metal of the screw fails in tension.

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Working Models for Exhibition Purposes

By Charles W. Geiger

WORKING models, miniature editions of the real thing are being used extensively by manufacturers in various parts of the United States. Manufacturers who desire to exhibit their products at expositions, shows, conventions, etc., are finding this a very satisfactory way to tell their stories without going to the expense of transporting fifteen or twenty tons of machinery to the show or exposition. And everybody likes to watch a working model.

Mr. C. H. Frass, of the Jaeger Machine Company, Columbus, Ohio, has designed and built what is probably the smallest concrete mixer in the world. It is complete in every detail and is used at shows to demonstrate the principles of his mixers. The mixer is a complete working-model of the company's 16-foot machine.

Mr. Madsen of the Madsen Iron Works, Los Angeles, Cal., has built a miniature working model of a portable paving plant which is one-eighth actual size and actually passes the material through, drying and screening the material.

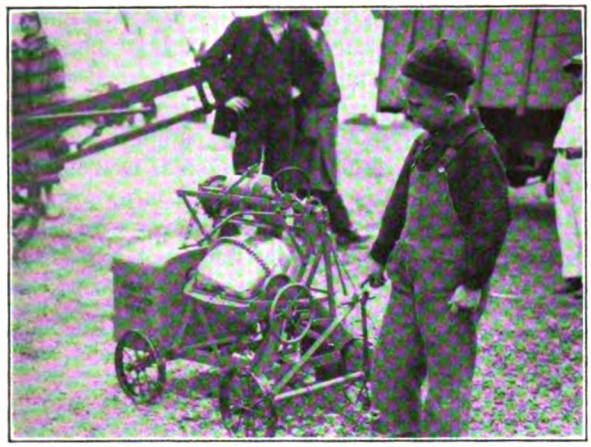


Fig. 1 A miniature portable concrete mixer

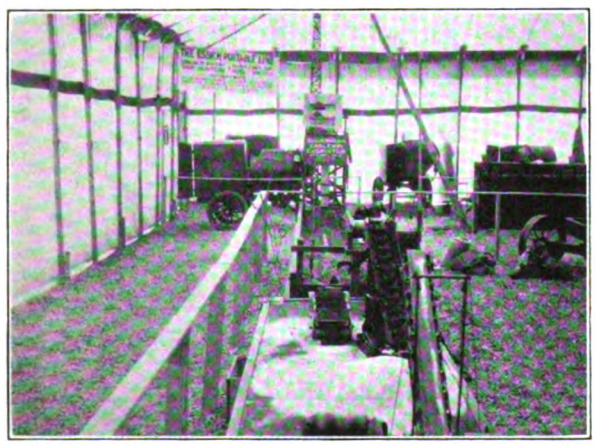


Fig. 2 Model cableway excavator on exhibition

The Smith Engineering Works, Milwaukee, Wis., has built a fully equipped miniature stone crushing and a gravel washing plant; the crusher actually making little ones out of big ones, and the gravel washing plant actually washing gravel.

The McKiernan Terry Drill Company of New York City have built two miniature working models of a double acting pile driver, in which one of the pile drivers is used in driving wooden piles into sand, the top of the sand being about a foot under the surface of the water, and the driver being entirely submerged during the last stages of driving.

Sauerman Bros., Chicago, Ill., have built a miniature model of a scraper and cable way excavator, which includes a brass mast eight feet in height equipped with all mast bands, sheaves, guy wires, slack line cables and other lines as used in standard equipment. This is used in operating a miniature scraper which actually handles sand placed in a long box.



Fig. 3 A display of miniature pile driving equipment.

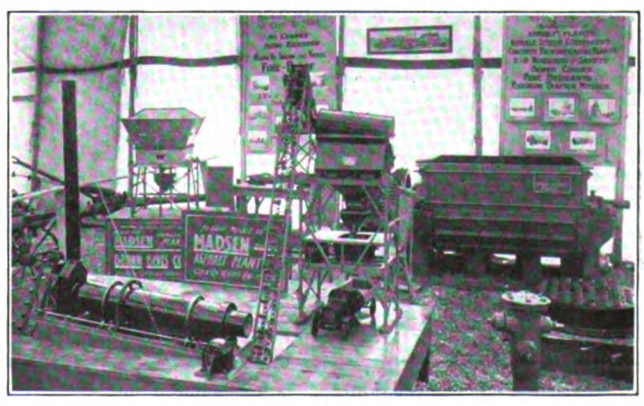


Fig. 4 Miniature mixing machinery used in asphalt plants

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The Problem of Choosing the Right Mixer

By F. C. Eibell

SO universal is the process of integration, covering as it does the mixing of liquids with liquids, solids with liquids, solids with solids, liquids with gases, and gases with gases that one might suppose the equipment used for this work was fairly well standardized. But, such is not the case. Of all processes used in manufacturing, on probably no other one is there such a lack of technical information.

The reason for this is obvious when we consider that each mixing, stirring, and agitation problem carries with it a set of conditions common only to itself. This frequently makes it necessary to test and try various combinations until the right one is found. To aid those struggling with an integration problem, and to make available a practical reference on this subject, this data was compiled.

The first mixing operation was probably done with the hands, and the logical step forward was to use a paddle. Primitive as this form may seem, data available indicates that power driven paddles are unusually efficient in mixing and stirring liquids.

Let us consider first the plain paddle. The stirring of liquids produces a swirling motion, and the inference is that this swirling is of the entire mass rather than of the particles making it up. The illustrations show in detail the various means used to break up the too uniform motion of the materials to gain better and more efficient integration.

The simplest variation is to tilt the blades, thus gaining a vertical as well as a horizontal motion. Another method employed is to suspend stationary paddles from the top of the mixer which break up the swirling motion caused by the revolving paddles. A modification of this is to have both sets of paddles revolving in opposite directions. And still another method employed is that of fitting the walls of the container with helical vanes which make the mix climb the walls.

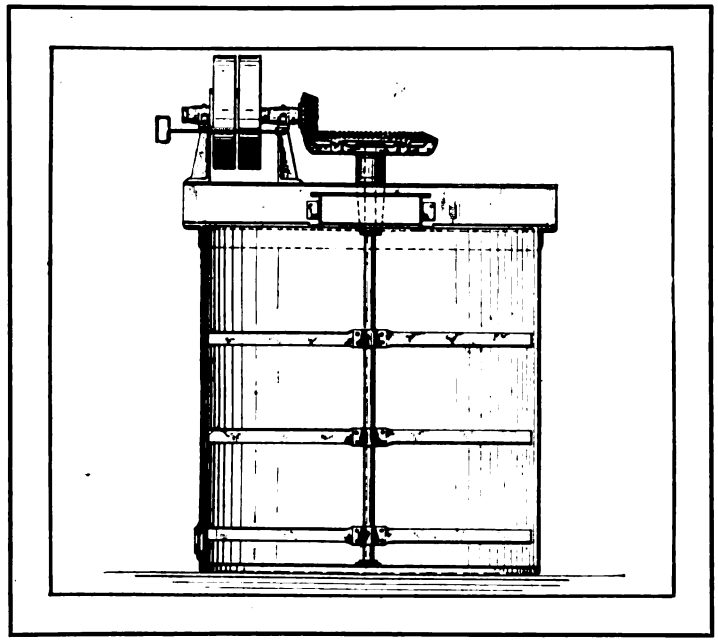


Fig. 1. The simplest type of mixer—open top, flat bottom with agitator.

Propeller agitation is very similar to paddle agitation. The fundamental difference is that propellers usually operate at higher speeds than paddles. The simplest form of propellers used are either of the two or three blade types. Marine propellers, they might be called. Various mountings have been found of value. In some instances two paddles are mounted on the same central shaft—one at the bottom and one nearer

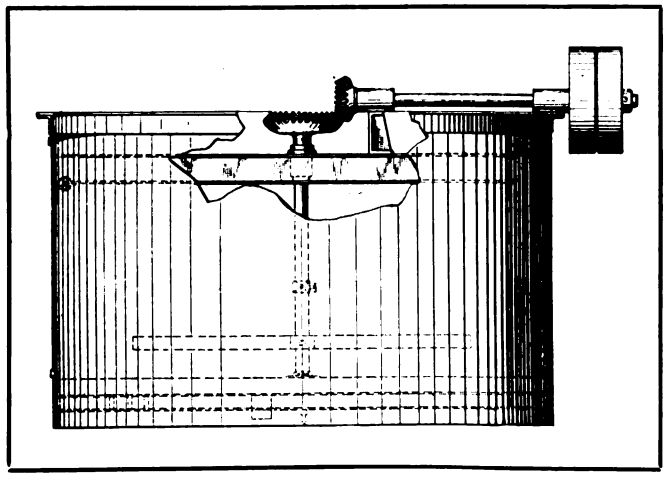


Fig. 2. A type of mixer [illegible] built-in transmission for limited [illegible] also has a jacketed, s

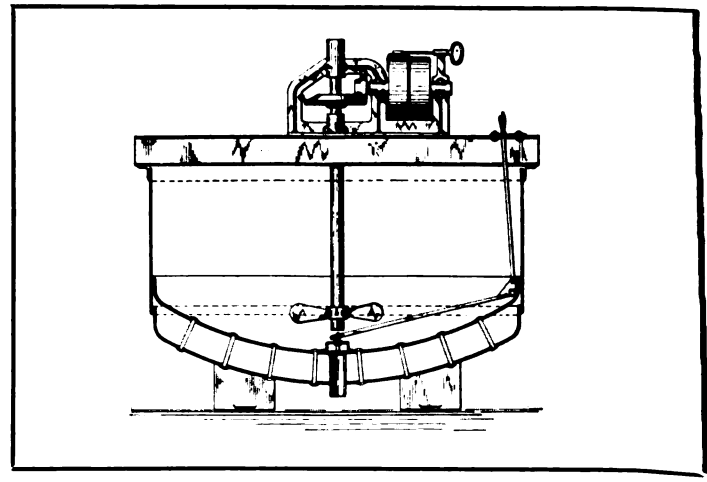


Fig. 3. A mixer made for handling materials that freeze. It has an open top, dished bottom with bottom saddles and an agitator.

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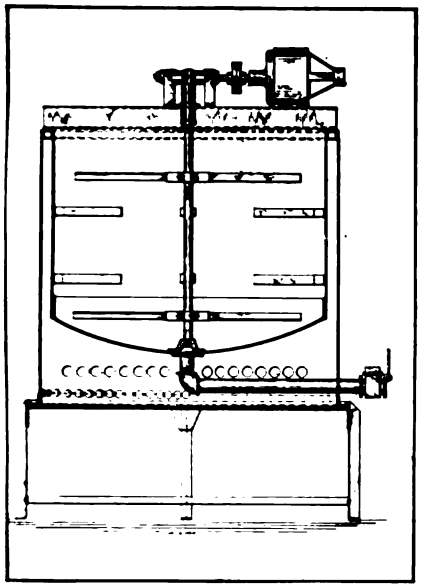


Fig. 4. A gas heated mixer with casing and a structural steel stand. The agitating arm is direct driven by a motor through a worm gear.

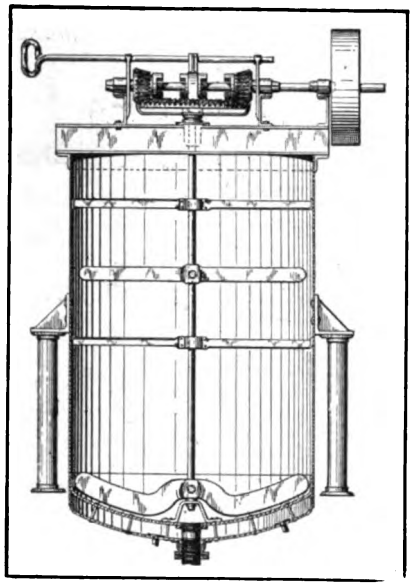


Fig. 5. A dished, jacketed bottom mixer supported on pipe legs. The drive provides for forward and backward movement of the agitators.

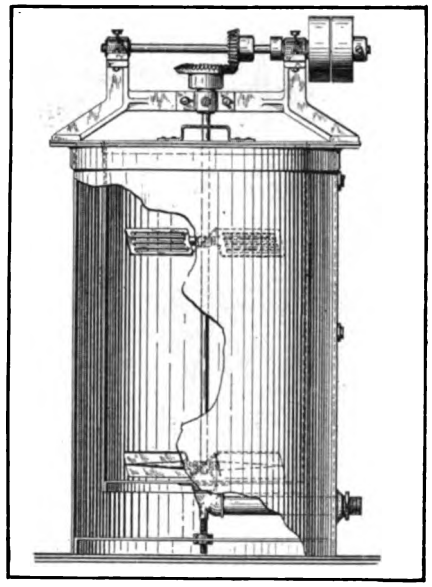


Fig. 6. A water jacketed mixer with adjustable agitator blades. The center outlet is heated by hot water, thus preventing clogging.

the top. In others a propeller is combined with a paddle. And, in still others a paddle and a propeller are combined with a scraper to keep heavy or viscous substances from settling or adhering to the bottom and sides of the container.

Although there are many combinations available, there is, undoubtedly, one which will give maximum efficient mixing when full consideration is given to the chemical and physical properties of the substances to be handled. The three elementary methods are: (a) container stationary with agitating unit inside; (b) container revolving with mixing element stationary; (c) a combination of (a) and (b).

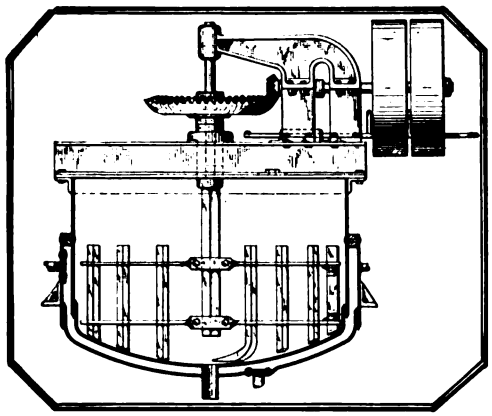


Fig. 7. This is a dished bottom jacketed mixer with a rake-type agitator to keep the bottom free from sediment.

In trying to decide on the mixer which will give the best results, the user is confronted with so many possible combinations that, unless he is thoroughly conversant with the results obtainable from each, the only safe way to decide is to put his problem up to manufacturers who have specialized in this type of equipment. Fundamentally the mixer must operate at the lowest cost. Its power consumption should be low as compared with the speed with which it accomplishes its work. Its capacity should be adequate. And, its construction sturdy, with braces, settings and parts of sufficient strength to

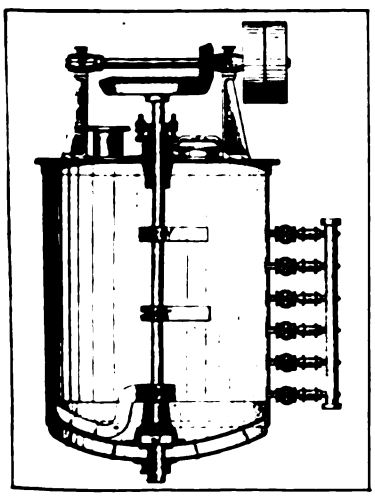


Fig. 8. A vapor-tight, bottom steam jacketed mixer with sight glasses. These permit the operator to watch the appearance of the mix at different levels.

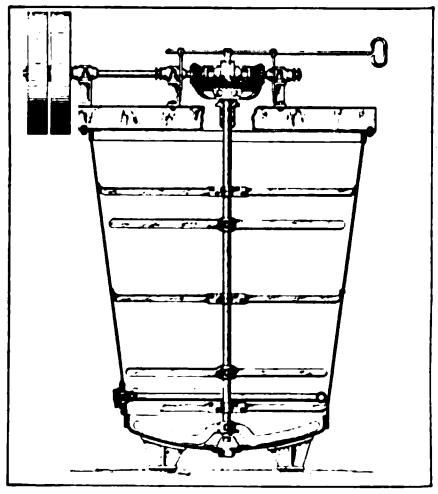


Fig. 9. Conical mixer with three stationary and two revolving agitators. There is a perforated coil in the bottom and a scraper on the rotating shaft.

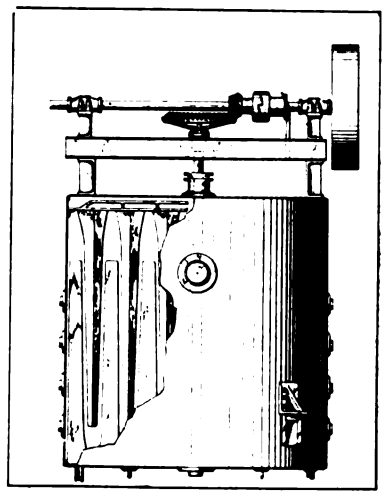


Fig. 10. A mixer designed for heavy duty. It has two agitator units, one stationary rake type and one revolving rake unit. They are used for mixing viscous plastics, as tar.

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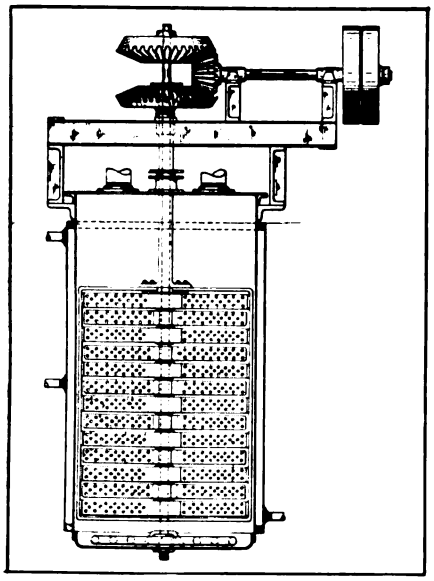


Fig. 11. A full jacketed mixer with an additional heating coil inside near the bottom. The breaker and agitator arms are perforated and run in opposite directions.

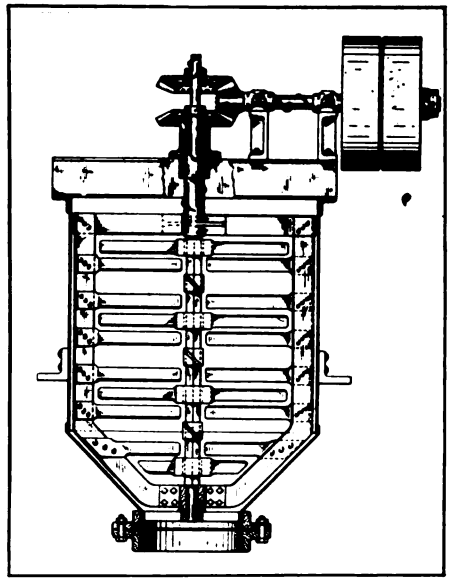


Fig. 12. A conical bottom mixer with a large sliding gate for quick discharge. Two sets of mixing arms run in opposite directions, one acting as a scraper against the sides.

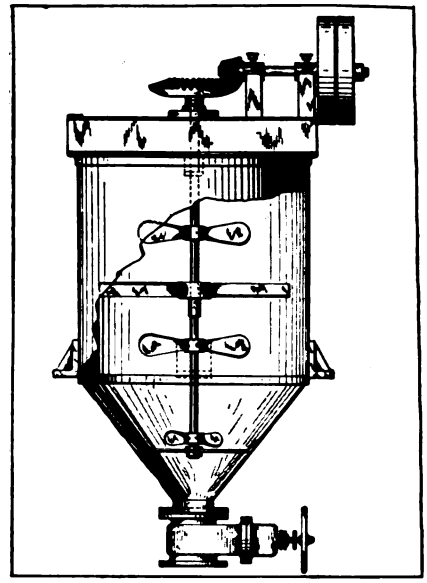


Fig. 13. A combination of propellers and paddles on the rotating shaft. This mixer has an open top, and a conical bottom with a large gate outlet valve for quick discharge of contents.

withstand the strains which will be developed.

The development of mixing equipment should never be attempted by an equipment manufacturer unless he has full details concerning the nature of the products to be handled. Too often the products to be mixed are clothed with so much secrecy that the equipment manufacturer must design the machine without adequate knowledge of the nature of the materials to be mixed or the exact result desired. Obviously, a piece of equipment built under such conditions cannot be depended upon to give the best result.

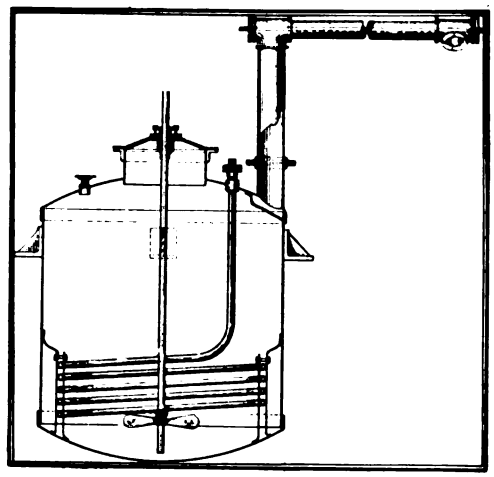


Fig. 14. This is a combination mixer and still. It is heated by an inside coil and has two propellors at the bottom.

Hence before attempting to develop a mixer of any type for any particular purpose extreme caution should be exercised to ascertain all the details necessary, and where the mixer is to be purchased. This information should be given to the manufacturer.

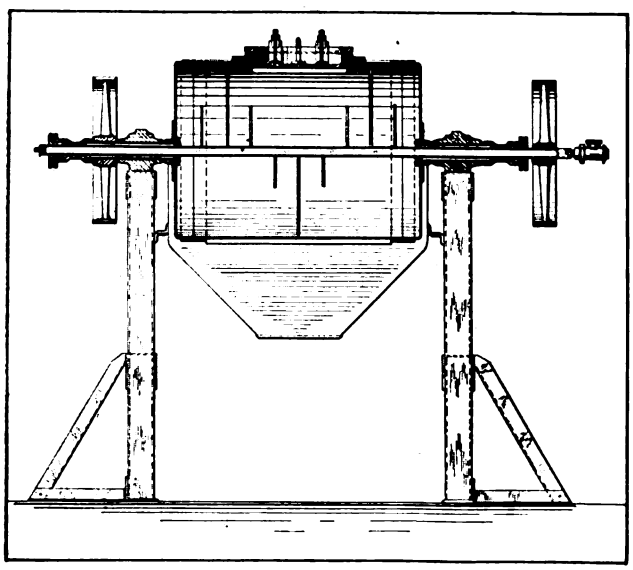


Fig. 15. An all-enclosed horizontal mixer. The agitator arms are [illegible] of pins or rods, let into the [illegible] has a large discharge op[illegible] for

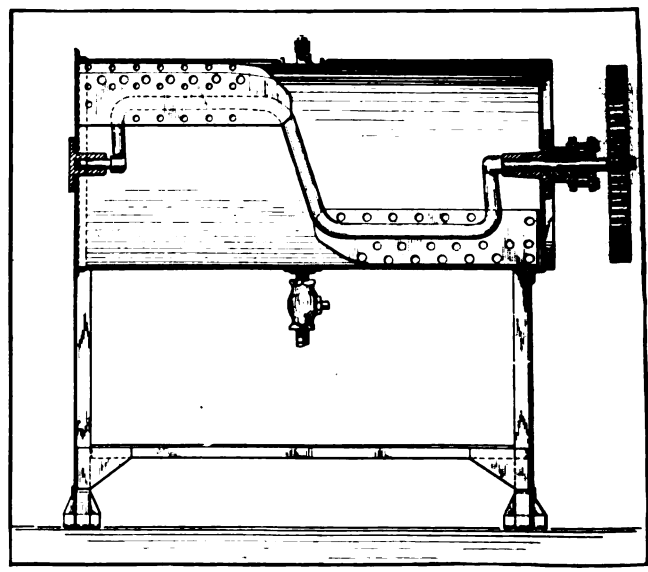


Fig. 16. Another horizontal mixer, mounted on a structural steel stand. This device uses what is termed a modified S-shaped agitator with perforated scraper blades.

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Miscellaneous Bulk Materials Handling

By Edward J. Tournier

THE handling of bulk materials in what may be termed the basic industries generally involves the use of extensive and therefore expensive machinery. The minor industries, however, have their problems also, and in the answers to these materials handling questions there may be the possibility of transforming a minor industry into a major one.

Many industrial waste products are now being used in the manufacture of articles of use in building construction, road work, fertilizers, concrete products, ceramics, etc.

Fertilizer and poultry feed from discarded oyster shells is one of the many developments in the use of by-products. A particularly efficient installation for this work consists of a small pulverizer, a bucket elevator, a revolving screen and a gasoline engine for furnishing power. Three sizes of product may be made, depending upon the market served. The entire installation is mounted on a platform, so that it may be transported where required.

Equally simple in construction, although not portable, is a plant for making road stone from discarded building stone. The equipment consists of a pulverizer, a continuous chain and bucket elevator and a revolving screen. Four sizes of product are made and stored in wooden bins from which they may be discharged to trucks.

The manufacture of acid and lime fertilizers, cement tile, sand-lime brick and concrete building block are industries where the raw materials are products that formerly were wasted. Now they can be easily reclaimed by the use of such equipment as is shown in the illustrations.

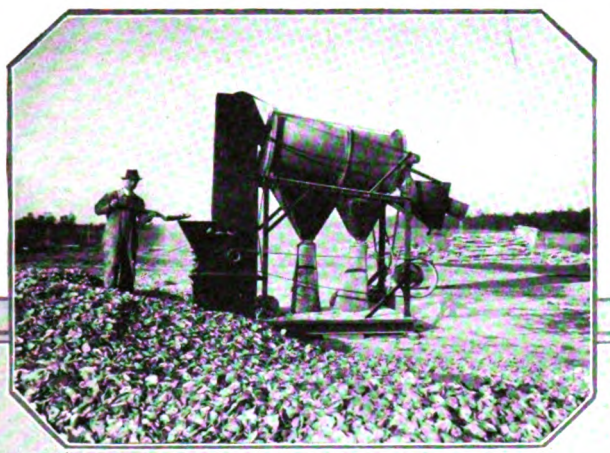


Fig. 1. A waste product is turned to profit at slight expense by a portable combination of pulverizer, elevator and screen for making poultry feed from oyster shells.

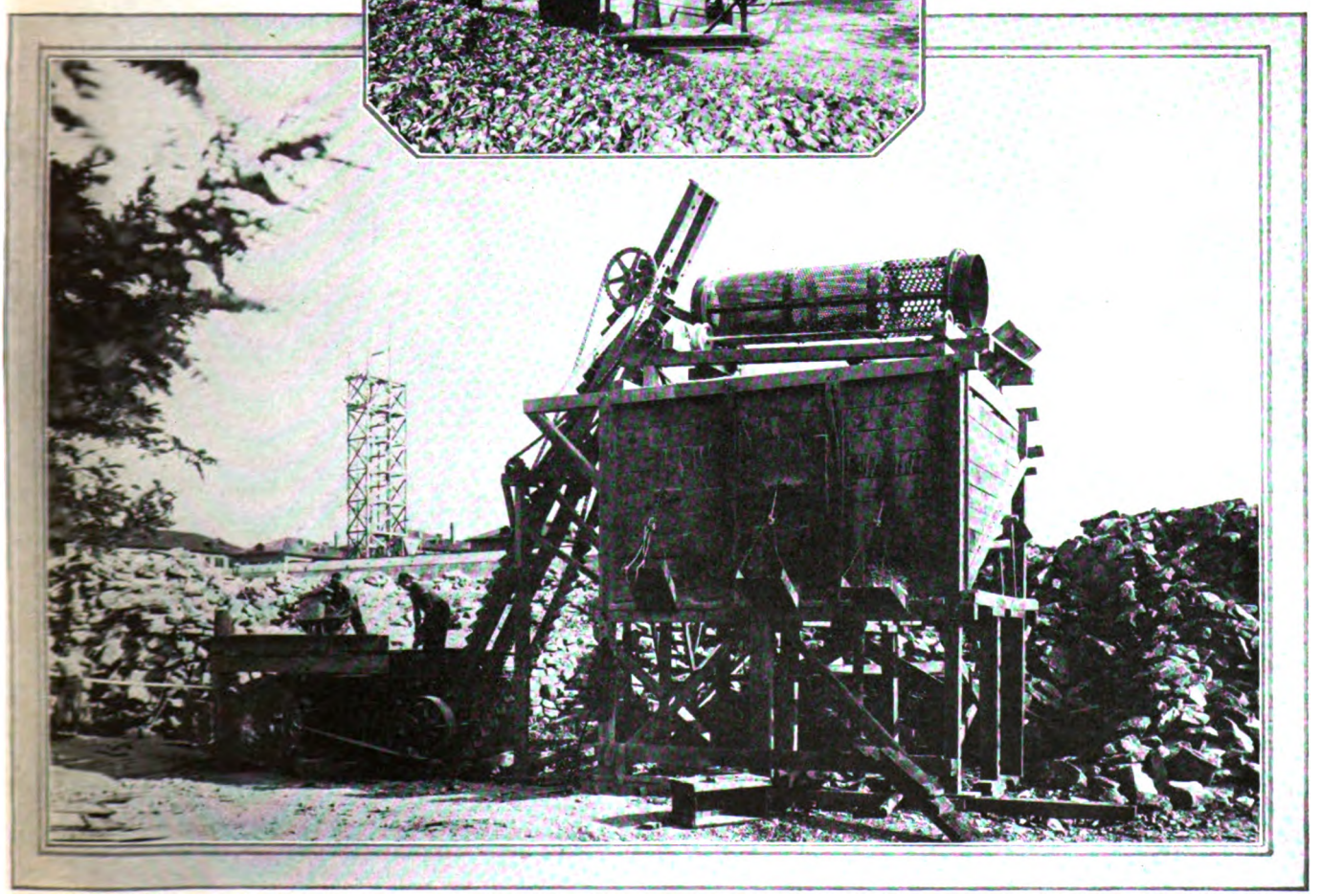


Fig. 2. A simple and inexpensive arrangement of crusher, elevator and screens with storage bins is used in the production of road stone from discarded building stone.

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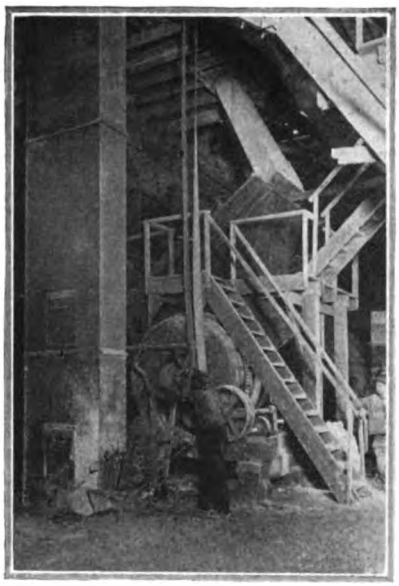


Fig. 3. A revolving mixer and screen delivering mixed acid phosphate to a bucket elevator.

Fig. 4. This view shows the type of pneumatic device used for making line separations in the sandlime brick process.

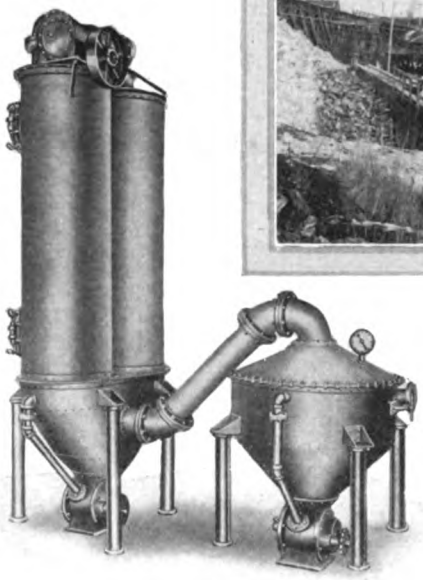




Fig. 4.-A. The lime burning kilns at the left are fed by a skip hoist with two balanced buckets. The skip is electrically operated, elevates 100 tons of limestone an hour 100 feet to the top of the kilns. The apparatus is mounted on a platform which travels on a track, in order to deliver to any one of six kilns.



Fig. 5. The continuous bucket elevator above takes lime from a track hopper and delivers it to the top of the storage bins at the right

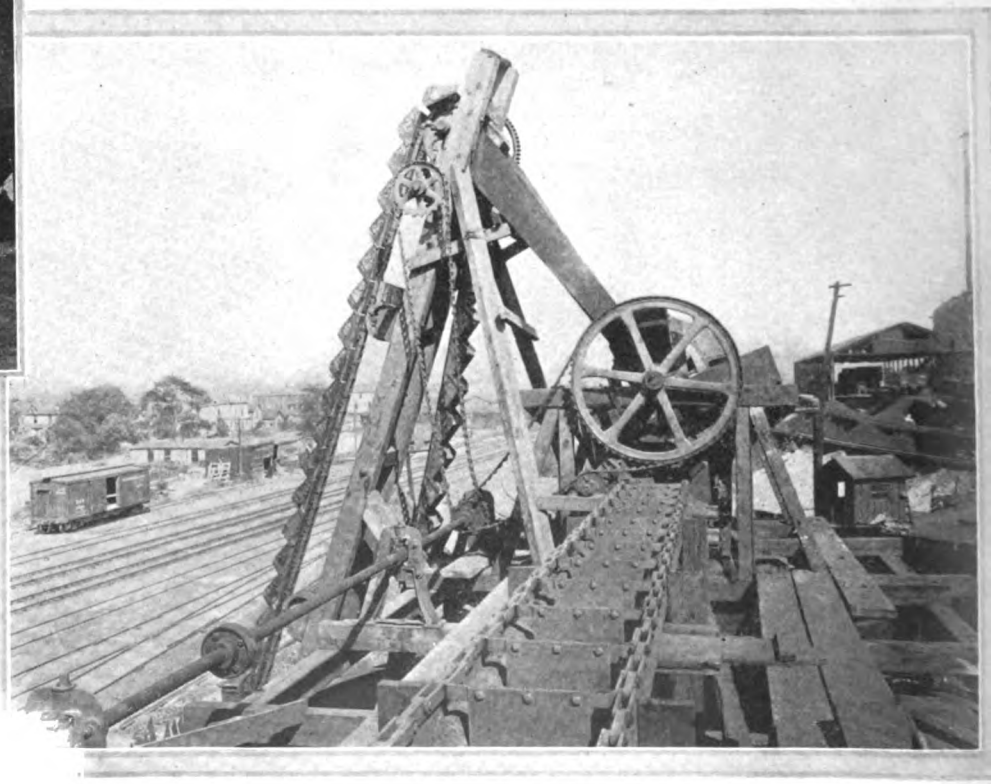


Fig. 5-A. A detail view of the driving mechanism of the elevator used for handling lime from track hoppers to bins. The spout from the elevator is discharging to a flight conveyor which distri material to the b

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Figs. 6 and 6-A. At the top the Hindoo method of excavation for a railway. Coolie women with wheel barrows and man-propelled dump cars do the heavy work. The same work could be done by the combination of truck and shovel shown in this view.

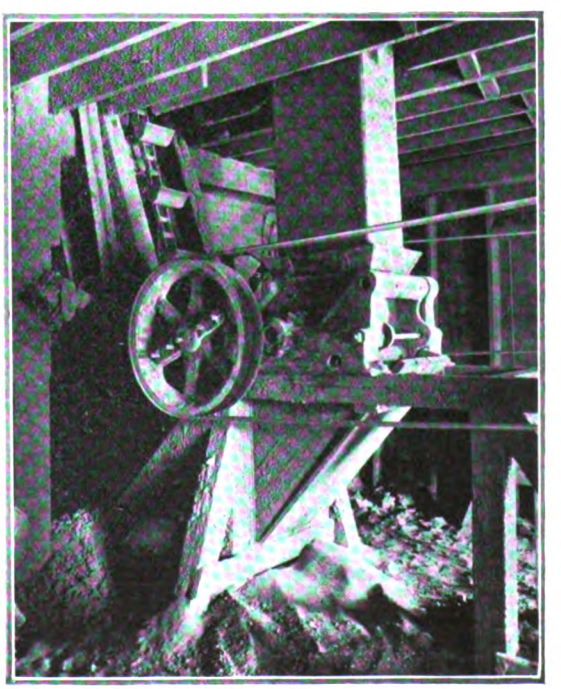
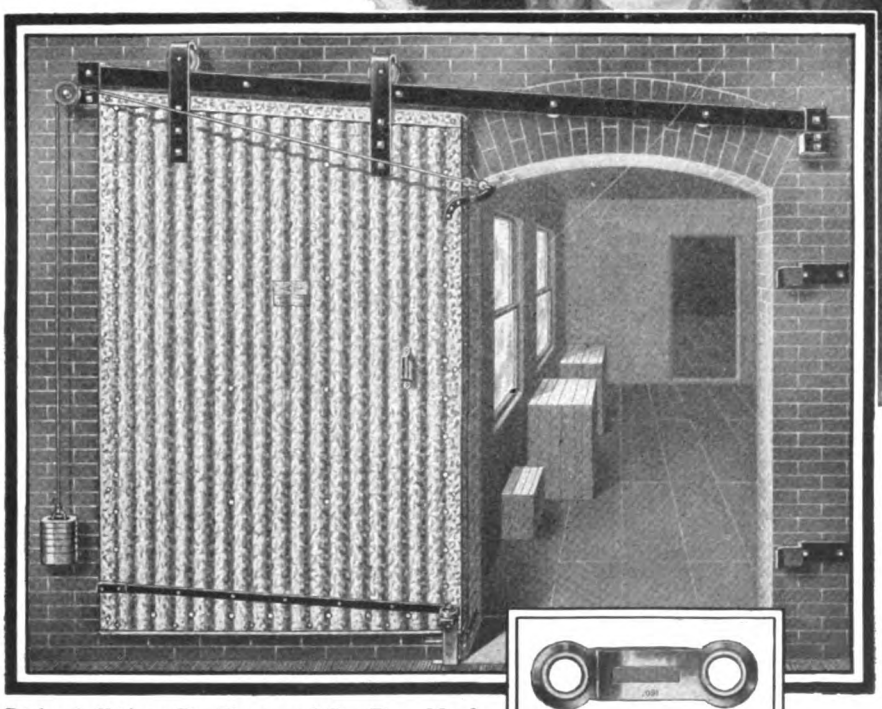


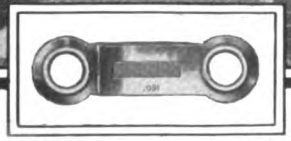
Fig. 7. Arrangement of a crusher and bucket elevator used in a small lime plant. Lump lime is crushed and elevated to overhead storage bins.

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Five-Story Arc-Welded Building Inspected

NOISELESS steel building erection was demonstrated before an inspection group of several hundred architects, builders, contractors and steel men at Sharon, Pa., December 15 and 16. These men were the guests of the Westinghouse Electric and Manufacturing Company in the first public viewing of its five-story arc-welded steel building now approaching completion in the Sharon Works of the company.

It is said the Sharon Works building is the first real multi-story skeleton steel structure, designed specifically for arc-welded construction, and is the first practical example of a new era in steel fabrication and erection in which the welders will supplant the riveting gangs. The floor dimensions of the building are 70 by 220 feet. The height will be 80 feet.

One of the most striking features was the absence of the nerve-racking riveting hammer. At a distance of a half-block from the building, it was practically impossible to hear any construction noises. Even when directly in the steel structure, conversation could be carried on in an ordinary tone. Noiseless building erection will be a long sought boon to those office workers in crowded cities or hospital cases, where the terrific noises of riveted buildings under construction has been the source of many complaints.

Another feature of the new method of construction that attracted attention was that riveters now working on the building have been converted into welders in three weeks of training, thus solving a problem of trade conversion. The clean looking columns and joints, caused by the absence of rivet heads were also commented upon by onlookers.

The new building is an outgrowth of years of experimenting by welding engineers. Data so provided resulted in steel fabrication and design which provides greater strength at joints and makes for less steel in building, the various members being lighter than is required for riveted construction. The Sharon building, for example, required 700 tons of steel while for a similar building of riveted construction 800 tons would have been needed.

Steel for the structure was fabricated in the plant of the American Bridge Company at Ambridge, Pa., with the columns all welded in the shops before delivery to the field just as in riveted construction.

Steel girders of the new building are of special design for arc-welding and not an adaptation of former practice, according to Gilbert D. Fish, consulting engineer of the Westinghouse Company, who is responsible for the design of joints and columns used in the new building. The continuous construction provided by welding the steel causes an exceeding rigidity, according to Mr. Fish.

The first public announcement concerning the new building was made in July of this year, when a series of tests were made of arc-welded columns and joints for building purposes in the Carnegie Institute of Technology in Pittsburgh. The tests were made as public proof of engineering development in arc-welding by the Westinghouse Company and showed that welded joints were stronger than riveted joints—were, in fact, stronger and more resistive to strains than the adjacent beams. It was also developed that the saving in steel effected in

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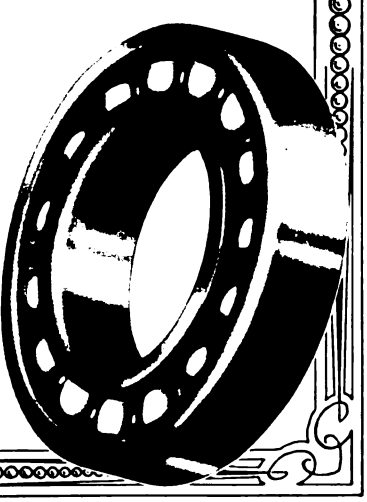
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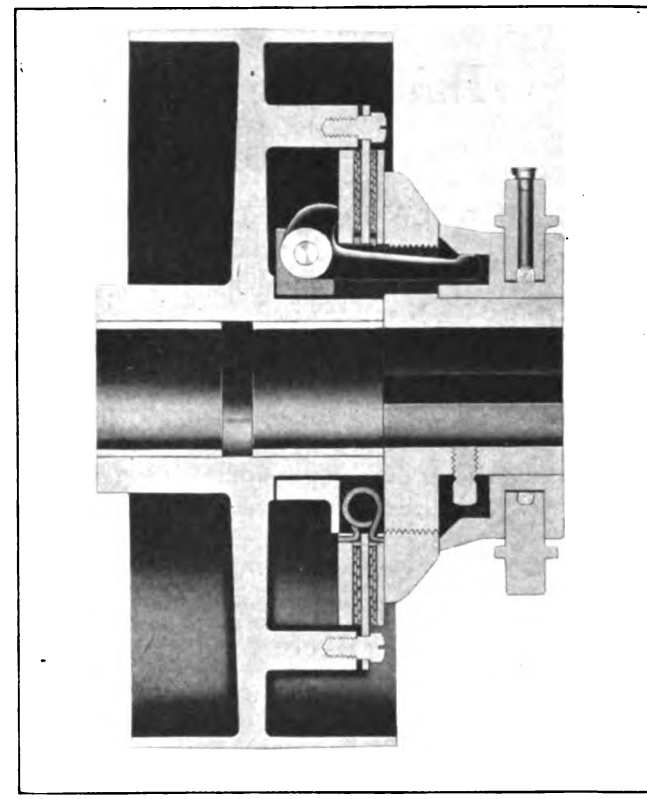
1500F Peoria Life Bld- -ria, Ill.

arc-welded structures was considerable, not only because of the elimination of thousands of plates and angles now necessary in riveted buildings but also because lighter beams could be used. In riveting construction the size of the beam is frequently determined by the strength required of the riveted joint, rather than the weight to be carried by the members so joined.

A New Disc Clutch

THE Conway Clutch Company, of Cincinnati, Ohio, has recently introduced a new development in disc style clutches, of both the single and multiple disc types. The single disc type, shown in the accompanying illustration, has a metallic asbestos lining and is made in three sizes, to accommodate shafts varying in sixteenths, from 1 to 2½ inches. In the multiple disc type the steel discs run in oil.

It is claimed that in working out the design of this clutch especial attention was given to make all parts



easily accessible. The clutch exterior presents a cylindrical contour, without projecting parts, and the actuating members are completely enclosed, with convenient means for adjustment.

The three actuating members are made of chrome nickel steel, heat treated. The discs are of heat treated steel, lined with woven asbestos, and the faces of the lining are ground to prevent dragging action against the discs. The body of the clutch is counterbored to permit the pulley to extend under the point of frictional contact, which it is stated, is a means of saving shaft space.

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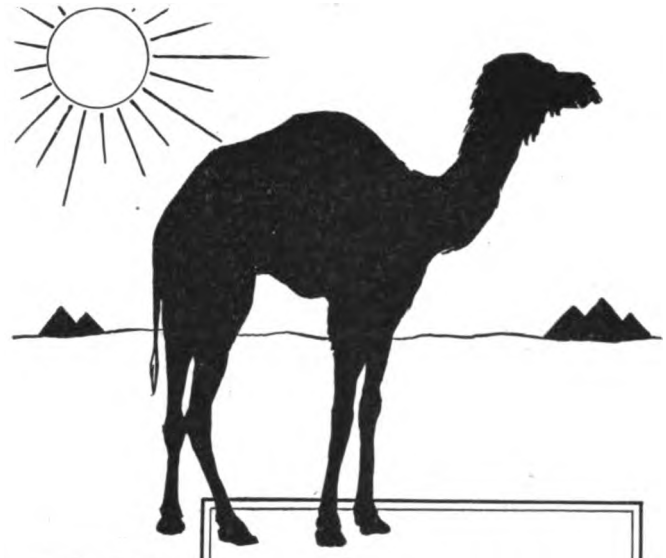
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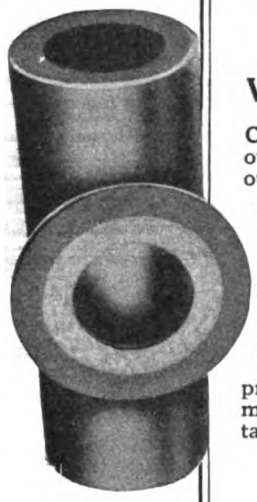
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This Arguto Bearing was in constant use on the countershaft of an 18-inch Lodge & Davis engine lathe for twenty-two years — and when taken down showed only .0124 inch wear with not a cut or scratch, and an inner surface polished like a mirror.

TWENTY YEARS WITHOUT A DRINK!

Camels go a week or more without a drink. Then time is taken out to hunt an oasis. While the camels are being replenished with water the caravan is halted.

But, at that, the camel has something on metal bearings. For they function only as long as they have constant care and attention. But the usual treatment of bearings on quantity production machines is intermittent oiling. Then friction takes its inevitable toll.

Machines Are Stopped
Production Ceases
Idle Hands Stand Around

New bearings are put on—and another red-ink entry goes in the ledger. Argutos have gone 20 years without oil or attention. Their economy and reputation are international.

If you care to know more about these 20-year bearings just fill out the coupon.

Arguto Oilless Bearing Co.
Wayne Junction, Philadelphia, Pa.

Arguto
OILLESS BEARINGS

Arguto Oilless Bearing Co.,
Wayne Junction, Phila., Pa.

Please send information and facts about Arguto Oilless Bearings.

Name .....

Address .....

City and State .....

When writing about advertised in this issue write Industry Illustrated

Nationwide Campaign Launched by Advocates of Metric System

WITH the beginning of 1927, advocates of decimal metric weights and measures for the United States have organized for an energetic campaign. At its recent annual convention in Philadelphia, the Metric Association outlined plans for greatly increased activity.

The All-America Standards Council, with headquarters in San Francisco and Washington, D. C., is urging prompt legislative action by Congress, establishing the decimal metric units for general use in merchandising throughout the United States after 1935. Its executives announce that metric standardization is urged by Thomas A. Edison, John Hays Hammond, Samuel Vauclain, John J. Pershing, Theodore Roosevelt, Franklin D. Roosevelt, Arthur Capper, E. N. Hurley, William G. McAdoo, Roger Babson and many others eminent in national affairs.

Led by such influential groups as the New Orleans Association of Commerce and the Washington Manufacturers' Association, more than 300 important chambers of commerce and industrial organizations are urging liberal metric legislation.

Among other important organizations advocating the metric adoption are the National Wholesale Grocers' Association, American Chemical Society, National Wholesale Druggists Association, Associated General Contractors of America, American Institute of Architects, National Congress of Mothers and Parent-Teacher Associations, Institute of Radio Engineers and the National Research Council.

More than 100,000 petitions urging metric legislation have been placed before Congress, and as many of these are from large organizations, altogether they represent several million voters. The States of Illinois, California, Tennessee, North Dakota and Utah are among those which through their legislatures have petitioned Congress to adopt the metric standards for all the people.

The great Pan-American Standardization Conference, to be held in the United States during 1927, is expected to emphasize the need for the world-uniform decimal metric measures in commerce. All the American republics except the United States are already on the metric basis in merchandising.

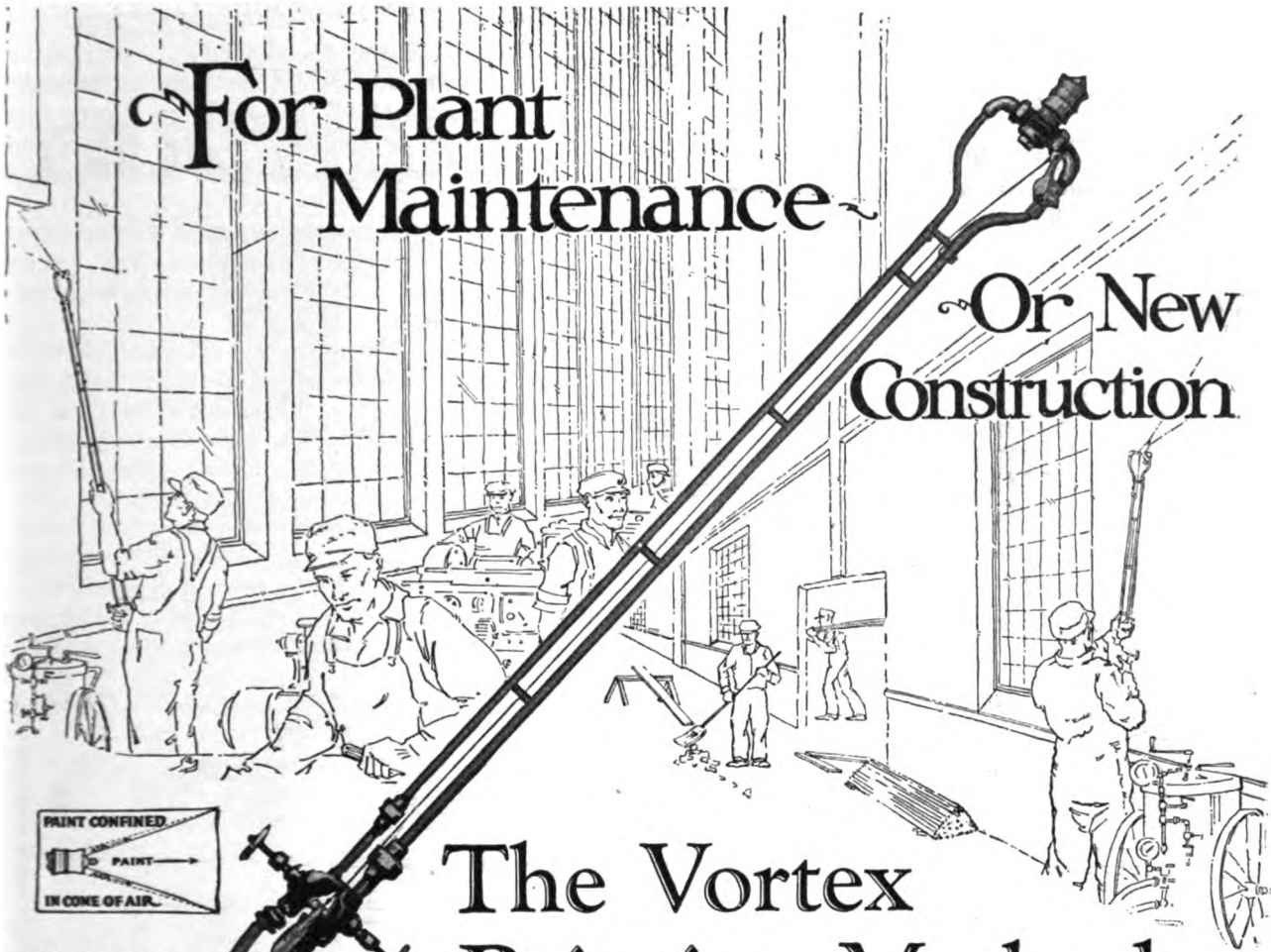
A New Rotating Cam Limit Switch

THE Electric Controller and Manufacturing Company of Cleveland, Ohio, announce a new rotating cam limit switch to be used with magnetic controllers for the automatic control of machines having such fixed sequence of operation as slowing down, stopping, and reversing.

This switch is totally enclosed, is equipped with tapered roller bearings and is designed to carry up to six sets of contacts. The cams which operate the opening and closing of the contacts are each adjusted independently of the others and can be fixed at an infinite number of positions, thus giving extreme flexibility to the machine with which it is used.

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For Plant Maintenance—Or New Construction



Equipment Furnished Without Cost

The Vortex Painting Method

for years past has been solving the maintenance painting problem for the biggest industrial concerns—cutting costs in two, with better results.

Now the same organizations are turning to Vortex Painting for their new plants and their plant additions—a good idea for owners of new industrial buildings everywhere.

Nothing else can rush a big painting job to such rapid completion—or save so much money—or do a better job. Let the coupon put you in touch with Vortex Paints and the Vortex Method.

THE VORTEX MANUFACTURING CO.
1977 West 77th Street Cleveland, Ohio



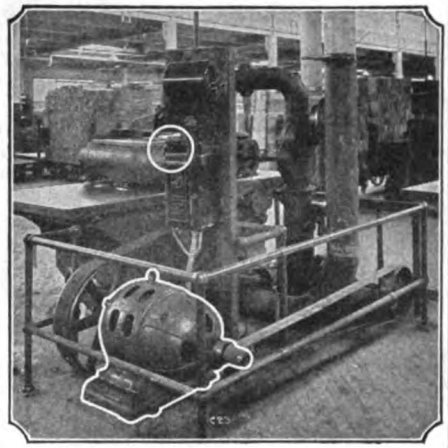
THE VORTEX MANUFACTURING CO., Cleveland, O.
Without obligation, please furnish me data as to painting costs on the following·

Old Bldg.....New Const.....
Name of Company.....
Address.....
.....
Individual.....
No. of Yards.....
Inside.....Outside.....Color.....
V-24



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"... push-button control" without extra cost!





Here's the simplest, cheapest, and most efficient push-button control there is. No compensator, simple wiring. Motor size makes no difference. TR Self-Start operating characteristics make it possible. The installation is in the Globe-Wernicke plant at Norwood, O.

Send the coupon for more information and quotation on sizes needed.

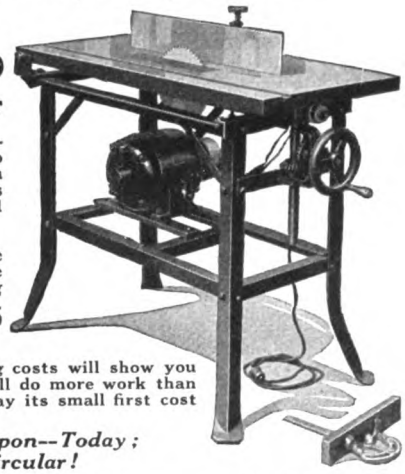
THE TRIUMPH ELECTRIC CORP.
157 E. 70th St., Cincinnati, Ohio

The TR is an A.C. motor with improved operating characteristics—the modern super-motor. 250% starting pull instead of usual 80%. No compensator in any size. Cuts first cost and current costs. Junk old motor ideas and improve plant efficiency with the TR motor! Send coupon.

The Triumph Electric Corp.,
157 E. 70th S., Cincinnati, O. I.I.
Send TR motor bulletin and price list.
We need motors for these machines,
.....
(with) (without) push button control.
Name .....
Firm Name .....
Address .....
City ..... *State* .....

Parks shipping room saw *at a lower price!*

was $75.00
NOW $60.00
without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast. Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon--Today; for circular!

FILL OUT AND MAIL THIS COUPON—NOW!

I. I.
The Parks Ball Bearing Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.
You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.
Name .....
Firm Name .....
Address .....
City ..... *State* .....

The Parks Ball Bearing Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

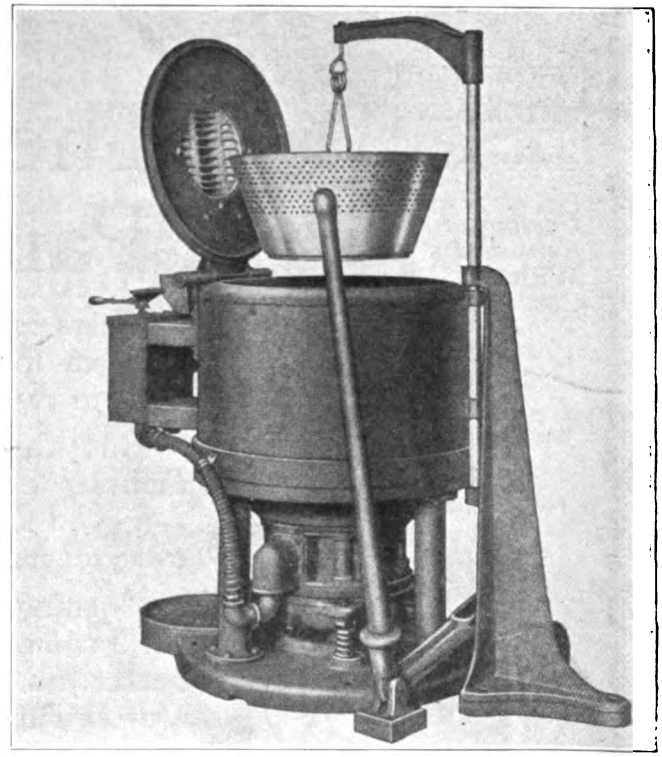
PARKS
WOODWORK[illegible] MACHINES

Curtis Cyclone Dryer

ONE of the recent developments in centrifugal drying machines is that of the Leon J. Barrett Company, Worcester, Mass., known as the Curtis Cyclone Dryer. It is of the self-contained type, and is manufactured in two sizes; one having a cubical capacity of 3,824 cu. in. and the smaller 1,440 cu. in.

This centrifugal dryer creates and forces a draught of warm arid air or room temperature air, if heat is disconnected, through the contents of the container, quickly absorbing moisture.

It is self-contained with direct drive and electric heat. All current automatically cuts off when the machine is stopped. It is operated by a single lever on a controller of the drum type. The right forward position for starting, locks in place for running. The left position reverses the motor causing a dynamic brake. The reverse position is spring actuated to avoid running in reverse unintentionally. If it is desired to dislodge or change the position of articles being dried, viz., cup shapes which may become so placed as to hold liquid and prevent immediate drying, reversing the machine and starting over again will often empty them by dislodging and turning them over in the container.



The container is one piece drawn steel in the shape of a truncated conic section, perforated part way down by 1/8-inch holes on 1/2-inch centers unless otherwise specified. Articles to be dried are placed in this container which may be lifted on and off the spindle by use of the hoist. The container cover, a flat steel disc, is provided with oblique slots edged with fins acting as fan blades. This cover is secured by the spindle nut which holds it firmly in place. Over the top of the machine at the center of the hinged lid is an electrically heated radiating grid for drying the air.

A strong current of air, passing down into the center and up the sides is developed by the centrifugal force of the rotating container. This would create a tendency

For pr[illegible]d in this issue write Industry Illustrated

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FRICTION the Masquerader



friction
masquerades
on your books
under the heading of
POWER, LABOR and OIL

FRICTION does not appear AS Friction on the expense side of your books. It hides—it MASQUERADES under other items — under power, labor and oil.

And the amount that you *now* pay for Friction probably would cover the cost of a complete SKF Self-Aligning Ball Bearing installation within the next two years.

SKF Self-Aligning Ball Bearing Hangers reduce power costs by reducing line shaft friction.* They cut oiling costs by making the matter of lubrication a twice-a-year detail, rather than an almost daily problem. They eliminate all expensive adjustments and repairs. No wonder there are more than three million SKF Self-Aligning Ball Bearing Hangers in use throughout the world today.

Why not put *your* line shaft hanger problems up to SKF?

*Combined Skayef Certified Surveys give full details of these savings in the plants of 17 manufacturers. Ask for your copy — today!

SKF

MARKED

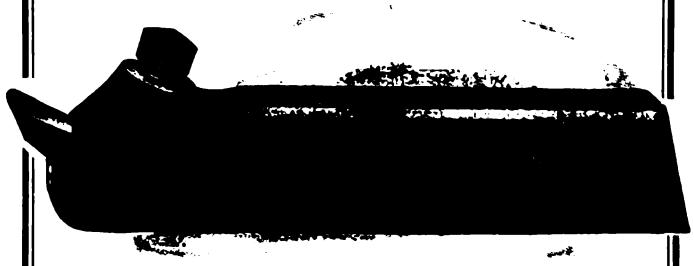
Self-Aligning **HANGERS** *Ball Bearing*

1725

SKF INDUSTRIES, INCORPORATED ~ 165 BROADWAY ~ NEW YORK CITY

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ARMSTRONG
TOOL HOLDERS



For Sheer Efficiency and Economy--You Can't Beat 'em!

Modern machine shops use ARMSTRONG Tool Holders because they increase production and cut maintenance costs. Dull tools can be replaced quickly as well as more readily set up. With ARMSTRONG Tool Holders, you do away with—ALL Forging; 70% Grinding; 90% High Speed Steel. Adopt the ARMSTRONG Tool Holder System. It pays!

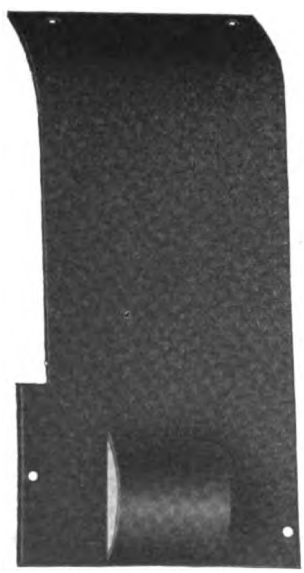
There is an ARMSTRONG Tool Holder for every job on the lathe, planer, shaper, slotter. Write for free literature.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

318 N. Francisco Avenue
CHICAGO, U. S. A.

Speed Up Your Production



Many firms have proven to their own satisfaction that they can speed up their production and eliminate some of their overhead by using

SHEET METAL PARTS

Where they formerly worked with castings. Sheet Metal Parts are always perfect in fit, require no machining and are free from culls.

If you have a difficult problem that you believe could be improved by the use of Sheet Metal Parts, you will find our engineering department ready to advise with you; all that we require is a blue print or pencil sketch.

Steel, Iron, Brass, Copper, Monel Metal—
Stamping, Forming, Drawing, Blanking, Punching

See Data A. S. M. E. Condensed Catalogue of Mechanical Equipment, also Chemical Engineering, McRae-Hendricks, Sweets Engineering, and Thomas Catalogues.

THE BREESE BROS. CO., Cinci[illegible]

For prod[illegible]

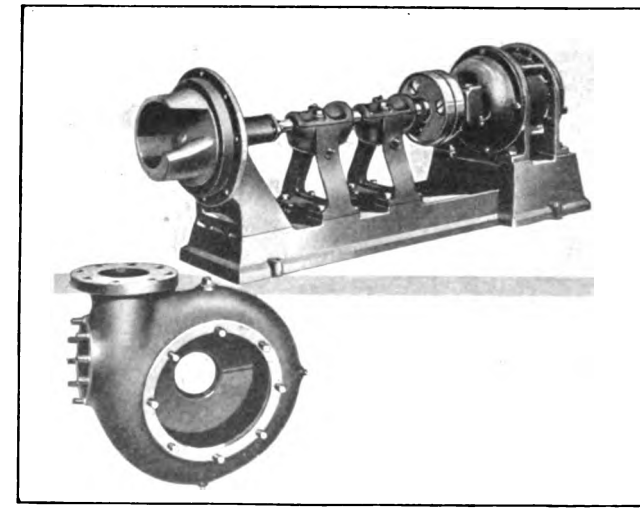
toward a vacuum at the center except for the openings in the container cover causing the suction through this cover. Aided by the fan blades which draw a volume of air through the grid the draft is forced in toward the center and out through the contents of the container. All the heat generated is used while running. When the electric current is switched off the grid holds heat during the interval between runs.

The container is filled two-thirds full of parts or material to be dried, leveled approximately. The disc cover is secured in place by the spindle nut. The revolving action which tends to move the loose parts toward the rim of the container forms a hollow cone at the center. This allows arid air to be forced to the bottom of the pan, before its course is reverted. Thus, the drying air permeates all the contents.

A Single Blade Centrifugal Pump

THE American Well Works of Aurora, Ill., has just placed on the market their non-clogging centrifugal pump. It is said the design of this pump marks a new departure in construction, which obviates the necessity of screens and their expensive maintenance.

The single blade impeller in the pump is so designed that the stream lines are not separated, but so the stream



of fluid is kept in one mass and carried through the pump without being subdivided. By compelling all the liquid and debris to be discharged through a single peripheral passage, there is avoided the possibility of different portions of a single piece of debris being swept into different outlet passages and thereby being confined within the impeller. This precludes screening sewage or fluid containing other material before pumping.

Fluids containing stringy matter, mineral matter, animal matter, and vegetable matter such as hair, string, waste, shavings, rags, mud, chips, sand, sludge, wire, de[illegible]r house and fish market refuse, offal, [illegible]ls, straw, stable flushings, etc., can be [illegible]illy, it is claimed.

[illegible]ade in both vertical and horizontal types [illegible]r municipal sewage and general indus-

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The *pure cussedness* of Horsepower—

HORSEPOWER can either be a docile beast of burden or a wild, bucking broncho. It is born in the fire-box, just plumb full of "pure cussedness." It'll go up the smoke stack if it can. It will escape from your boilers. It will desert your steam lines.

Unruly though it is, it can be held in harness, in fact it must be, in any plant that is to operate efficiently and economically.

Johns-Manville has devoted over fifty years to the production of materials, of Asbestos and its allied products, to keep horsepower under control — insulations, packings, high temperature cements, etc. A Johns-Manville Power Specialty man is ready now to go over your plant with the view of saving your horsepower and your money.

JOHNS-MANVILLE CORPORATION, MADISON AVENUE AT 41ST STREET, NEW YORK
BRANCHES IN ALL LARGE CITIES. FOR CANADA: CANADIAN JOHNS-MANVILLE CO., LTD., TORONTO

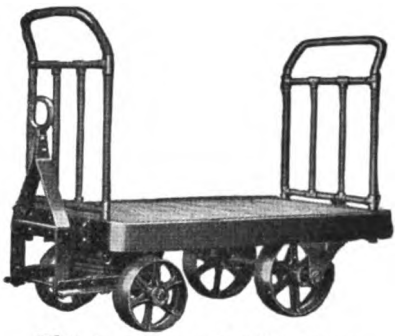
Through Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE
SAVES HORSEPOWER

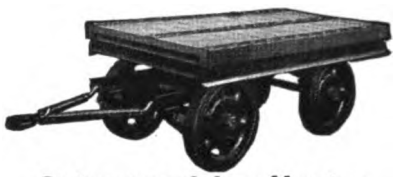
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Mercury pioneered th

—they are the only manufactu
tractors and trailers to w
is in the Mercury lin
to serve ev



This is a 4-ton capacity wagon-type steer. Bulletin A-125 tells about it



Spring suspended—rubber tires —a minature highway trailer. Complete specifications in Bulletin A-120



Dump body trailer for bulk material. For description request Bulletin A-120

—Mercury believes in the tractor-trailer system because it is the *accepted* and *proven* method of transportation.

—Mercury builds no power unit except the tractor, which *pulls* many laden trailers instead of carrying a *single* load.

—Mercury is the only tractor manufacturer who makes a full line of trailers to work with the tractor.

Correct in principle mean maximum in economic pe ance. Space will not perm presentation of the details o dreds of successful installat

American Car & Found
American Window Gl
Owens Bottle Company
Armour & Company
Wilson & Company
Southern Lumber Co.
National Biscuit Co.
American Railway Exp
Pacific Mills
Studebaker Corp.
Pennsylvania R. R.
Bush Terminal Compa
Chicago Whse. & Ter.
General Electric Co.
Eastman Kodak Co.

A incu



Mercury "Type H" (Medium Duty) Tractor operating in a large packing plant Write for Bulletin 106 describing Mercury Tractors

Me

Manufac

4112 So. Hals

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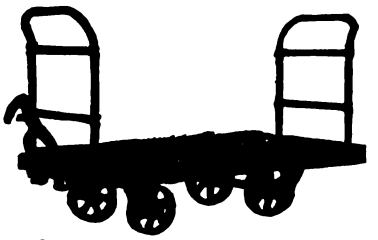
tractor - trailer system

uilding a complete line of
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ndustrial need

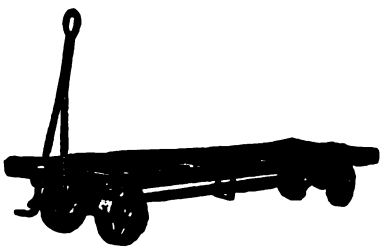
—Mercury sales engineers are tractor-trailer specialists. They know the equipment and how best to apply it.

—Mercury installations predominate. A little investigation will convince you of this fact. (Note the partial list of users below.)

—Mercury can—and will—demonstrate a complete installation in your own plant. We'll be glad to explain this service.



The all-purpose castor-type industrial trailer. Request Bulletin A-100



A four-wheel steer trailer for long commodities. Described in Bulletin A-120



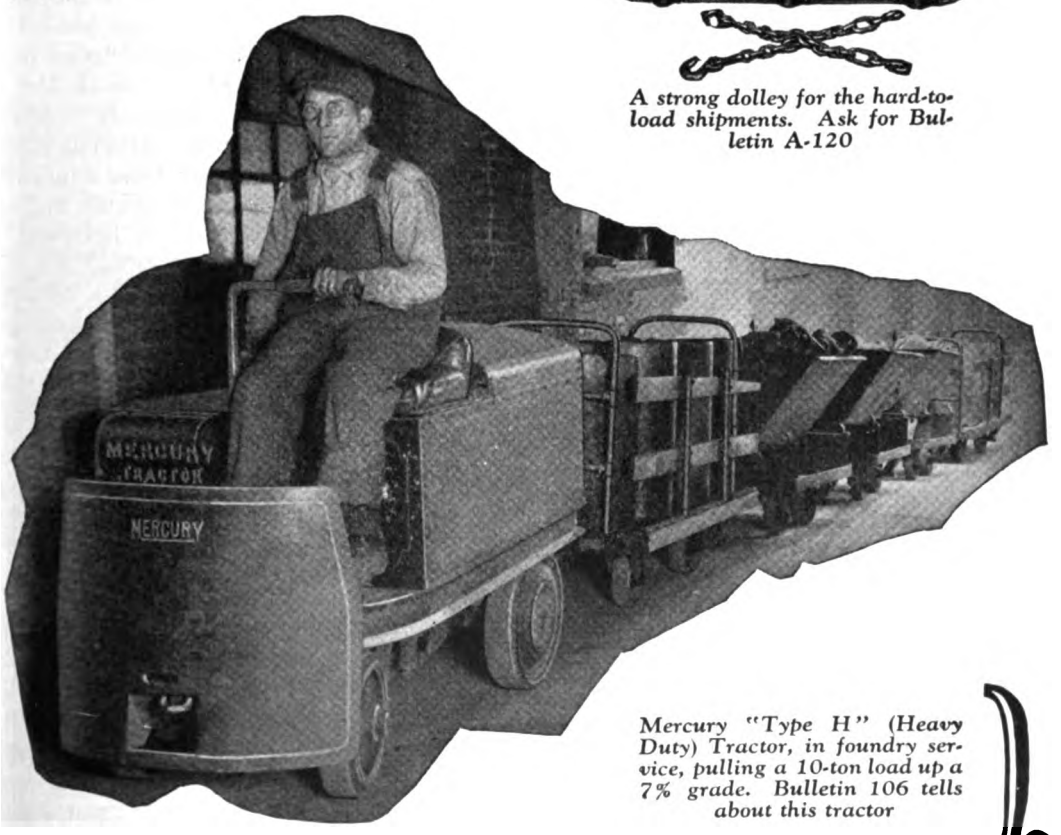
A strong dolley for the hard-to-load shipments. Ask for Bulletin A-120

—however here is a partial list of Mercury users, representing various industries, all of whom operate 10 or more tractors and fleets of trailers from 100 to 1,500.

Proctor & Gamble
Kimberly, Clark Paper Co.
Endicott & Johnson Co.
Eastern Steamship Co.
C. B. & Q. Railroad
H. J. Heinz Co.
Goodyear Tire & Rubber Co.
United States Gov't
Willys-Overland Co.
Cadillac Motor Co.
Lehon Company
Amer. Sheet & Tin Plate Co.
Nat'l Malleable & Steel Co.
Standard Oil Co.
Continental Motors Co.

r bulletins
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ury
ing Company
Chicago. U.S.A.



Mercury "Type H" (Heavy Duty) Tractor, in foundry service, pulling a 10-ton load up a 7% grade. Bulletin 106 tells about this tractor

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EVERYWHERE
The Brown & Sharpe Trade Mark Is Recognized as

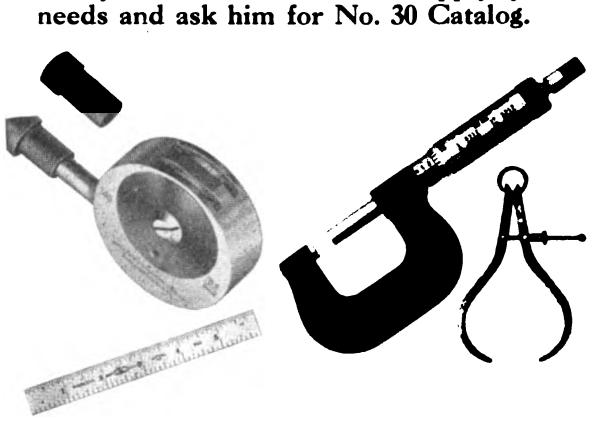
The World's Standard of Accuracy

Executives who shoulder the responsibility of buying machine shop equipment in large quantities know the advantage—indeed the necessity—of supplying workmen with precision tools in whose accuracy they have complete confidence.

The world of mechanics, toolmakers, motor service and repair men—the man of skill and training—invariably looks for the Brown & Sharpe trade mark when selecting precision tools.

For the accuracy of Brown & Sharpe precision tools has made their name synonymous with "standard" wherever such tools are used.

Let your hardware dealer supply your needs and ask him for No. 30 Catalog.



BROWN & SHARPE TOOLS

Brown & Sharpe Mfg. Co., Providence, R. I.

Means Found for Protecting Oil Tanks from Lightning

AN improved method whereby huge oil storage tanks may be protected from lightning, one of the greatest present day hazards of the oil industry, was described by F. W. Peek, Jr., consulting engineer of the General Electric Company at Pittsfield, in a paper read before the annual convention of the American Petroleum Institute at Tulsa, Okla., on December 9.

From experiments made with artificial lightning of two million volts and miniature oil tanks, Mr. Peek has learned how oil storage reservoirs can be protected from both direct hits and induced voltages, which may come from a lightning flash striking at a distance. He found that a pole or conducting rod protects from lightning an area within a circumference four times its height. Placing a number of such poles around a miniature tank, Mr. Peek found that his artificial lightning either hit one of the poles or struck at a distance from the tank. He also found that by placing a wire net or screening over the top, extending slightly over the slides of his model, induced voltages which might cause sparks igniting explosive gases in the tank were prevented.

"My investigations have shown that the safest way in fact the only way, to secure complete protection is with an all metal tank," Mr. Peek declared. "However, such tanks are not always economically feasible and the next best protective scheme is the metal or wire net roof over the top of the reservoir, used in combination with protective rods or poles placed about the tank. This arrangement is not as good as an all-metal tank but the costs are much less."

Frequently, especially with certain kinds of oil, th space in the tanks between the top surface of the oil an the top of the tank becomes filled with gases or an ex plosive mixture of air and oil vapors. Where such gase can be kept out, the chance of induced lightning voltage causing trouble is small, Mr. Peek explained. "It ma then be necessary only to protect the combustible top o the tank or the oil from direct hits," Mr. Peek said. "Bu where there are these explosive mixtures, the protectio problem is more difficult and expensive. A spark at 50 volts, caused by a lightning stroke miles away, cou ignite such a mixture."

Because of the size of oil tanks, they are generally bu of reinforced concrete and are frequently 500 feet more in diameter and 30 feet deep. Often as many 25 or more of such tanks make up the so-called "ta farm."

THE British coal strike began the first week of M and ended in November, 1926, a period of nea seven months. A million miners and their families l their chief source of income during the entire perio The unemployment dole paid by the British Governm did not apply to trade union members while they w on strike. In the iron industry there was practically production during the last eight months in 1926.

During the first month of the strike the registered u employed in Great Britain increased from 1,030,000 nearly 1,700,000. At the end of the year the registe unemployed numbered 1,360,000 as compared with 170,000 a year ago.—*Alexander Hamilton Institute.*

oducts not advertised in this issue write Industry Illustrated

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Now in Its 50th Year of Service to Industry



1877 The small workshop shown above represented the Jeffrey Manufacturing Company half a century ago.

WHEREVER coal is mined or converted into steam and electricity—

Wherever rock and clay and sand are turned into brick and cement—

Wherever logs are ground into pulp, and pulp rolled into newsprint—

Wherever manufactured products are carried from process to process—

There Jeffrey Material Handling Equipment carries an important part of the load.

In fact, during the half century since its organization in 1877, the Jeffrey Manufacturing Company has solved material handling problems for every basic industry.

In the future new problems will arise, and for these also Jeffrey Engineers will find practical solutions.

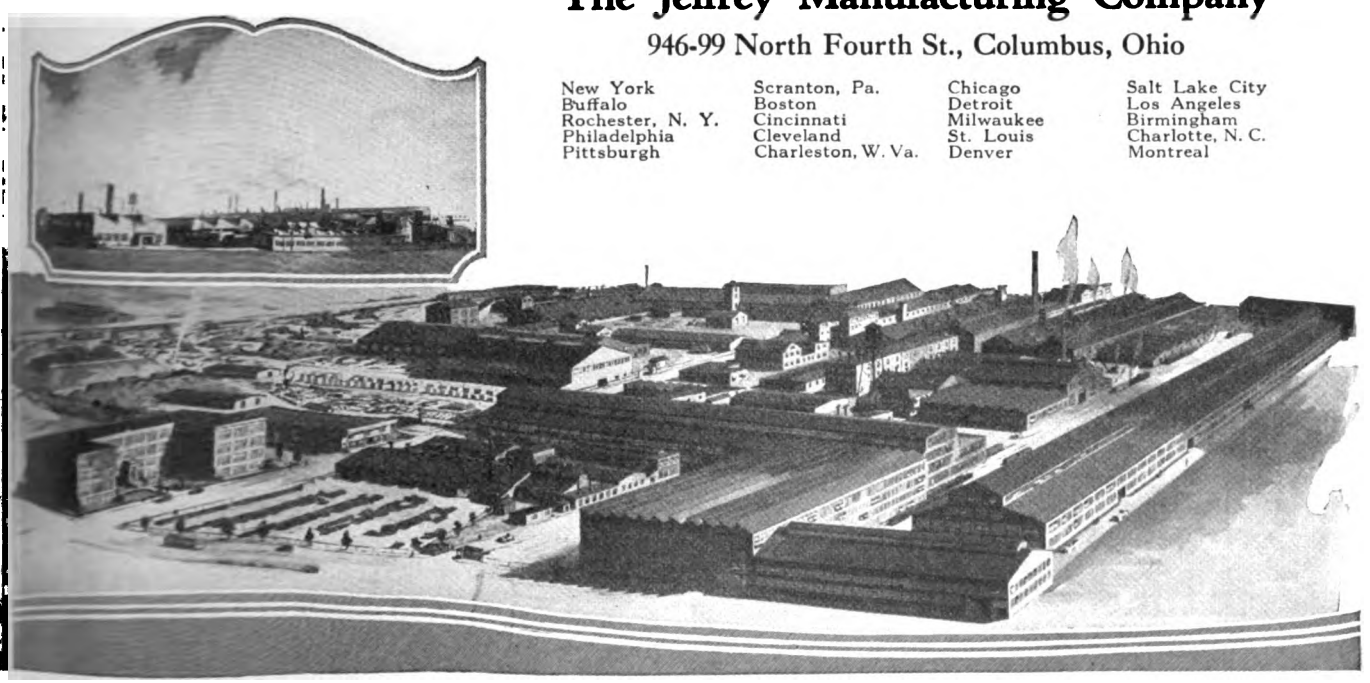
The name JEFFREY, like the *sterling* stamp on silver, has come to mean "the guarantee of a trustworthy product."

1927 The present plant as shown below together with its malleable foundry, in the panel, covers more than 60 acres of ground.

The Jeffrey Manufacturing Company

946-99 North Fourth St., Columbus, Ohio

New York	Scranton, Pa.	Chicago	Salt Lake City
Buffalo	Boston	Detroit	Los Angeles
Rochester, N. Y.	Cincinnati	Milwaukee	Birmingham
Philadelphia	Cleveland	St. Louis	Charlotte, N. C.
Pittsburgh	Charleston, W. Va.	Denver	Montreal



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ESTABLISHED 1912
PLIMPTRUCK
B.E. SCRIVEN PATENTS
STABLE AS THE PYRAMIDS
The LIFT TRUCK with the Knuckled Steering Wheels



Here are four men —at least 680 pounds—all standing on the edge of a standard Plimpton truck,— still they can't tip it over.

These trucks are absolutely

Stable
Dependable
Durable

Let us tell you *why*.

National Distributor

C. A. GRAHAM,
170 Broadway,
New York City

Some good territories open

Erecting Buildings to Secure Light

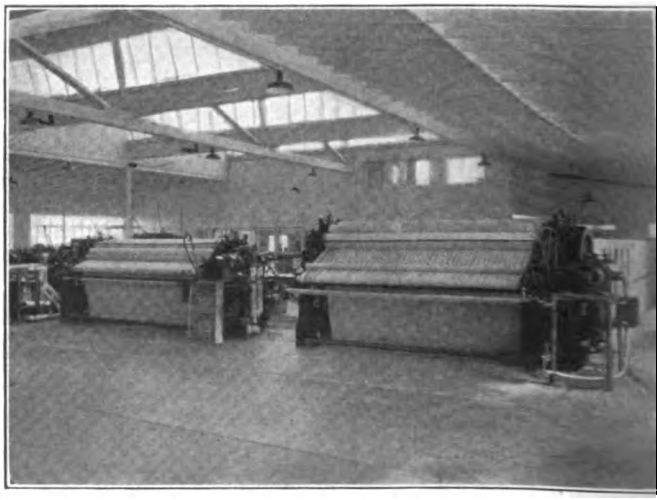
By A. C. Prendergast

AS a means of providing a maximum of light with a saw-tooth roof when the building faces north, the Red Star Laundry, of San Jose, Calif., surfaced the unglassed slopes of the saw-tooth valleys with white asbestos roofing, while to get the ventilation that



is possible with a monitor type of roof the roof trusses were run at right angles to the saw-teeth, instead of parallel, so the glass could be opened.

Sunlight coming from the south and east is thus reflected more fully than if an ordinary roofing surface was used, while corrugated glass windows in the saw



teeth diffuse the light so that no direct rays enter the workroom of the laundry to hinder the operators.

In many cases it is impossible to open the louvres because the big roof trusses running parallel to the saw teeth interfere, but by running them at right angles the difficulty has been removed.

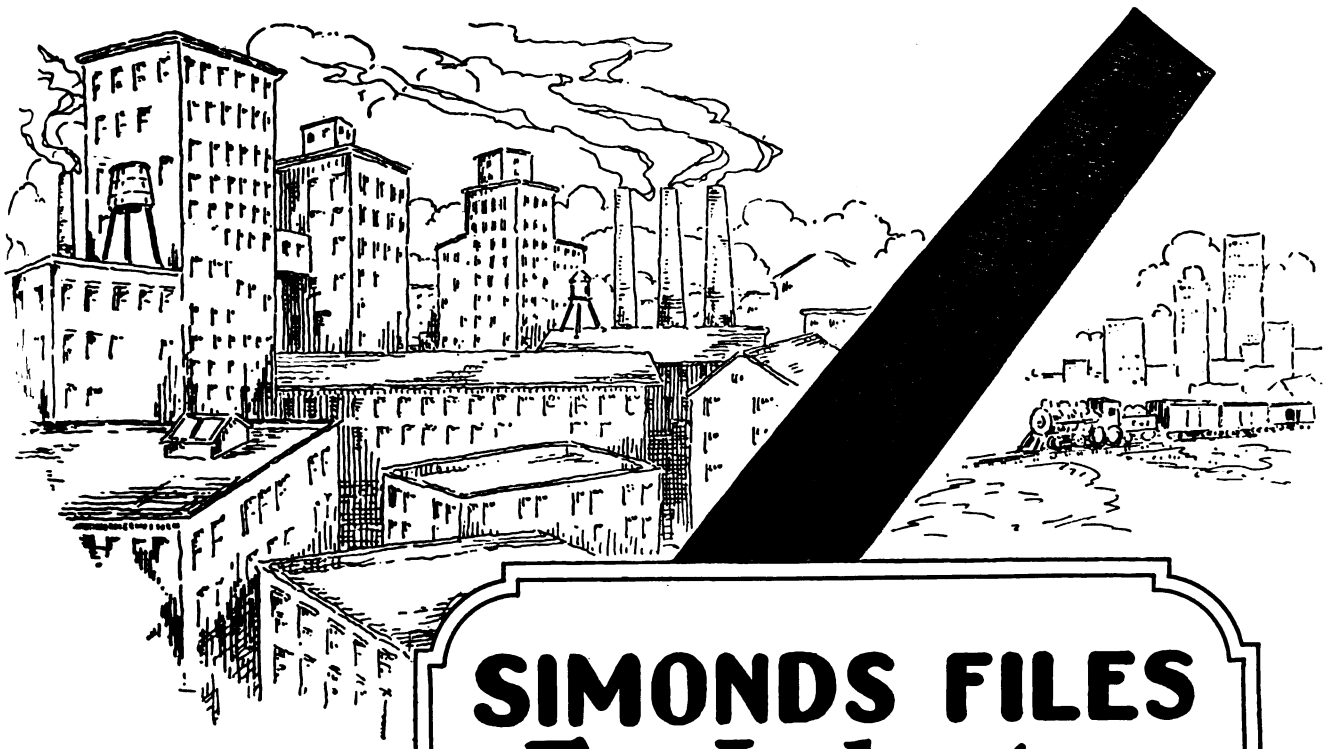


The blade that lasts the longest, cuts the most and is adaptable to the largest number of jobs in your shop, is the most economical. Users of the Victor hack saw blade have found that it is the cheapest blade in every way.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

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SIMONDS FILES For Industry

It's the teeth, sharpness and hardness with a foundation of high-grade steel that make Simonds Files the best for industry. In machine shops where accurate filing is essential, Simonds Files give the best service. They are uniform in hardness from tip to tang and resist wear on the hardest kind of filing. They cut fast, removing more metal at each stroke.

Order from your dealer.

Simonds Saw and Steel Company

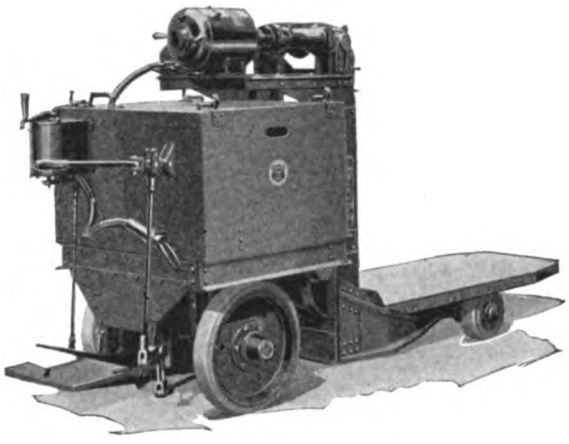
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SIMONDS FILES

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Lakewood



Short Turns

In the jam of present day traffic it's the car with the short turning radius and quick "get-a-way" that beats the red traffic light.

Because of its short wheel base and four wheel steer the Lakewood 703-LS has the shortest turning radius of any Tier Lift Truck of its capacity. That means something in turning short corners and getting in and out of tight places in your industrial plant.

The Lakewood 703-LS is built to standard specifications with a lift capacity of 4,000 lbs. Bulletin 25-D tells the story.



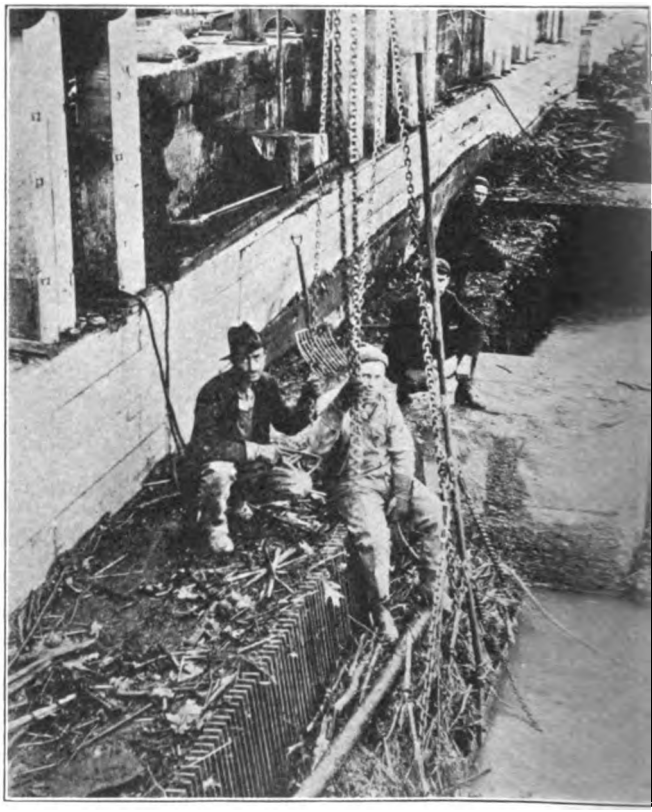
The Lakewood Engineering Company

Cleveland U.S.A.

Powerful Rake Clears Forebay of Trash

FIGHTING the water-soaked logs and submerged branches that fill the forebays of hydro-electric plants in the Georgia hills becomes a serious matter in the springtime when the freshets bring down tons of this unwelcome material. To remove this trash calls for strong apparatus that will do the work rapidly and will not get out of order at just the moment when its services are most urgently needed.

W. C. Sullivan, Superintendent of the Morgan Falls station of the Georgia Railway & Power Company, decided after years of this intermittent warfare that there ought to be some better method. Accordingly, he called his inventive faculties into play and devised an electric hoist that is handling the accumulated debris in a highly satisfactory manner. This rake is heavy and rigid. It seldom gets out of order.



This rake is made of structural steel. It has tool-s teeth and a steel handle that slides through a short tion of pipe attached to the motor-driven chain-h carriage. This hoist carriage in turn runs on a c stretched between supports over the top of the fore racks.

About 24 feet above the racks and just above the w level is stretched a ½-inch guy wire that carries a d to which a ½-inch block and tackle is fastened for p ing the rake away from the racks while lowering i take a load.

The rake itself consists of a 9-foot "L" that meas 7/16 in.x3 in.x6 in. To this are fastened U-shaped t

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IF —

you could save $25,000.00, you'd do it, wouldn't you?

And that is just what the Greenwood Coal Co., Greenwood, Arkansas, saved, and they were so enthusiastic about it they wrote us and enclosed actual photographs. The acid water in their mines played havoc with their equipment, but the greatest loss was their bronze impellers. They solved the difficulty by p a i n t i n g them with VALDURA ASPHALT PAINT and now they have practically standardized on it. We will be glad to supply you with this data, together with photographs if interested.

This is only one of the many s e v e r e conditions VALDURA has to contend with. Industrial centers have just as severe conditions, if not more so—we have found this out through actual experience.

The base of VALDURA is 99.5% pure Gilsonite Natural Asphalt. It is absolutely waterproof and acid and alkali resisting. It spreads farther than ordinary paints and lasts from two to five times longer, so the labor cost of application is reduced to minimum.

Make a comparative test of VALDURA with any other preservative you have in mind—we will be glad to send you a sample.

We don't claim VALDURA is cheap,
except in the *long run.*

AMERICAN ASPHALT PAINT CO.

844 Rush Street **Chicago, Ill.**

Factories: Lincoln, N. J.

Warehouses: Oakland, Calif., Chicago, Ill.



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The Marvel of Sawdom

ONAN "SAFTY SAW" will cut crating costs **50%** and sawing costs **90%.** Think of the profit this will make in your shipping department, and what it means to eliminate hand sawing! Think of the crating lumber that can be salvaged quickly and economically!

Of all the machines ever devised to speed up work in the shipping room or to save lumber, none have ever cut costs like **ONAN "SAFTY SAW".**

With this MARVEL OF SAWDOM, one man can do the work of ten men sawing by hand. He can cut lumber for crates, build bins, resize boxes, reclaim scrap lumber—all at a saving as high as 90%. Cross cuts, rips, miters—any sawing job, carpenter work, maintenance, repairs.

ONAN "SAFTY SAW" is PORTABLE, can be moved anywhere on wheels provided (not casters). Runs from the lighting socket. Easy to handle.

Shippers everywhere, large or small, are using and praising the **"SAFTY SAW".** Why not try one at **OUR expense.** Tear at the black line, sign and we will **mail** details and our free trial suggestion. No obligation or expense on your part, nor will a salesman bother you.

D. W. ONAN & SONS

202 Royalston Ave., Minneapolis, Minn.

D. W. ONAN & SONS, 202 Royalston Ave., Minneapolis, Minn.

As per your advertisement, we would be interested in further details on **ONAN "SAFTY SAW".**

We have direct current.....Alternating current.....

Name.....

Company.....

Street.....

City.....State.....

27 in. long. Strips welded between the tips of two teeth at each end of the rake keep the teeth from projecting through the rack. The handle of the rake is 35 feet long. It is flattened at the lower end and bolted to a piece of strap iron, which in turn is bolted to the rake cross-member. A ring is also fastened to this strap for attaching the chain from the motor-driven hoist and the block and tackle for pulling away the rake from the racks in lowering. Chains containing turnbuckles at the upper ends tie the outer ends of the rake and the intermediate parts to the handle.

The one-ton electric chain hoist is of the hook type and is equipped with a 35-foot lift chain. In clearing away the trash that is raked on to the platform at the top of the racks, men have to load it on a flat boat with coke forks.

Ten Years of Idleness

By W. F. Schaphorst

A CERTAIN hard working owner of a mill who knows all the ins and outs of every department of his business insists on taking a hand in practically everything. This ambitious habit sometimes leads to amusing occurrences. Perhaps it would be better to say that it leads to amusing non-occurrences.

For example, a number of years ago this man purchased a new machine. The manager of the mill wanted to start the machine immediately, but the ambitious owner said "No, wait a while, I am busy at the inventory now." A month later the manager brought the fact to the attention of the owner that the machine was still idle, and the owner said, "That's right. We'll have to get it started soon but I'm busy right now at so and so."

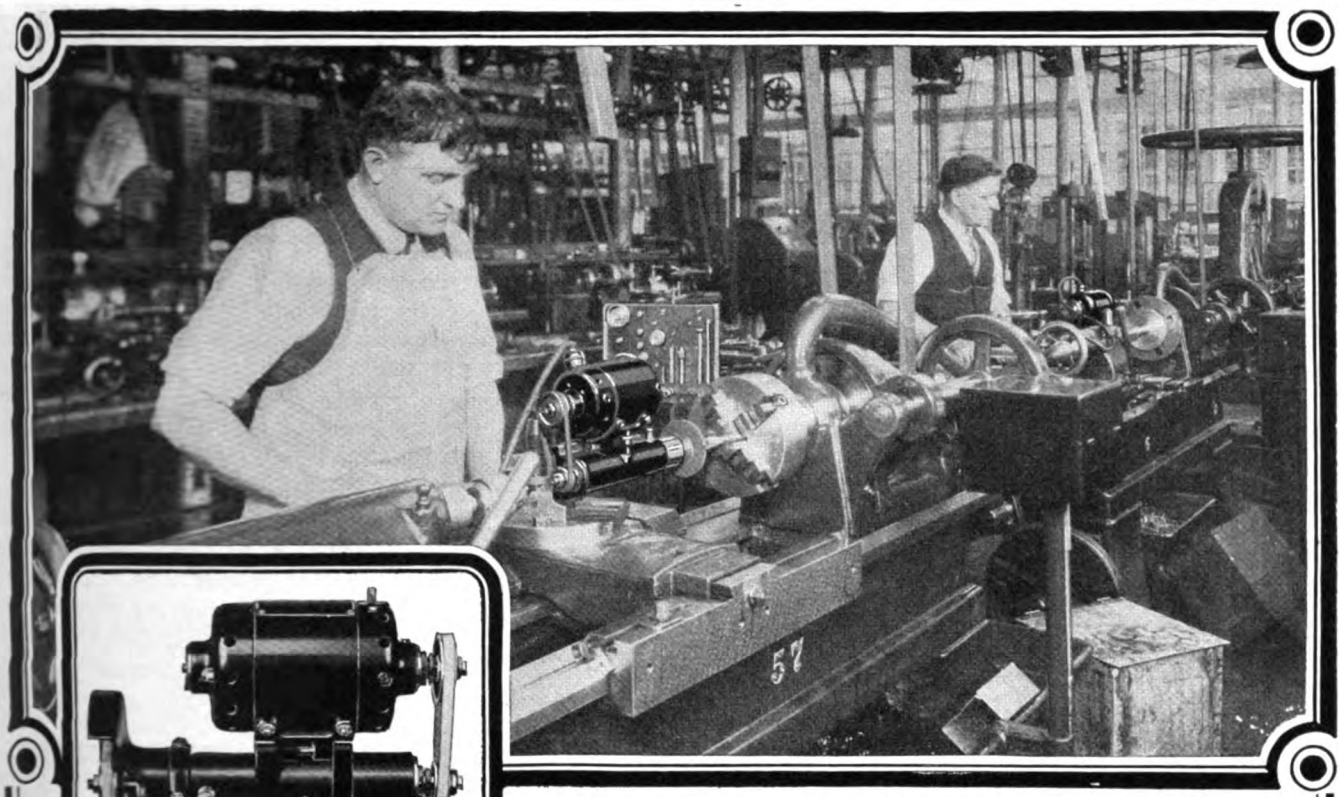
The manager brought the machine to the owner's attention a number of times and the same thing happened so regularly that the manager after a while was content to let the matter drag and nothing was said or done.

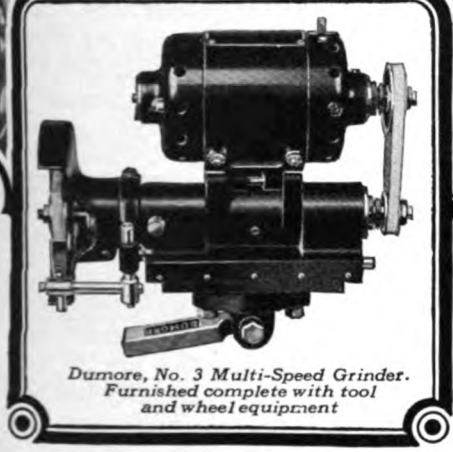
Ten years later a new manager came upon the scene. He was there but a short time when he approached the owner and said "I need that machine. Let's get it started." Even then, however, after ten years, the owner put off the new manager. In fact, he put him off several times, but the new manager was more persistent than the first one, and proceeded to persistently "nag" the owner until finally in desperation the owner got busy and put the machine into operation with his own hands. That was what he wanted to do all the time. The only reason for the postponement was that he wanted to get it started "with his own hands." The machine has been operating constantly and with perfect satisfaction ever since. The manager could have started it but the owner wouldn't allow him to do so.



roducts not advertised in this issue write Industry Illustrated

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Dumore, No. 3 Multi-Speed Grinder. Furnished complete with tool and wheel equipment

One Standard of Accuracy

YOUR reputation for accuracy of work and your volume of production; two influential factors in your business, can be greatly improved with Dumore Grinders.

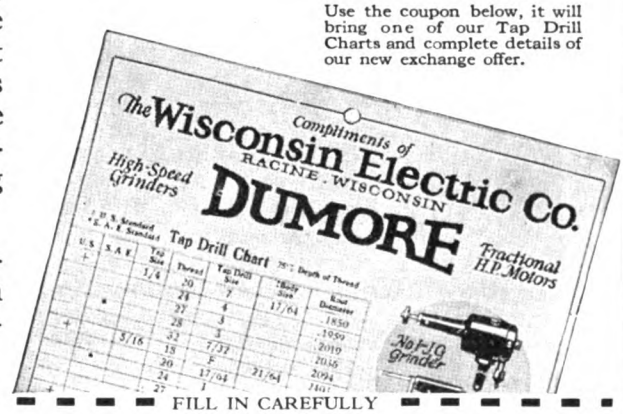
Exacting grinding jobs, internal and external, on large pieces and small, are easier to handle if you use Dumore Grinders. To turn out more and better work many manufacturers have installed whole batteries of Dumore Grinders. The economy, durability and accuracy of this equipment are paying them big dividends on the investment.

Send for our latest booklet showing the application of Dumore Grinders to many uses, a Free tap drill chart and details of our exchange offer. Use the coupon.

Dumore Grinder Advantages

There are six Dumore Grinders with individual speed ranges from 3,600 to 50,000 R.P.M. Correct speed without vibration, eliminates taper, bell-mouth and chattermarks, common with less efficient tools.

Use the coupon below, it will bring one of our Tap Drill Charts and complete details of our new exchange offer.



DUMORE

High Speed Electric Toolpost Grinders

Mail the Coupon—It will bring a Free Tap Drill Chart and complete details of our trade-in plan.

FILL IN CAREFULLY

Wisconsin Electric Company, 70 16th St., Racine, Wis.

Please send me Free, a Tap Drill Chart, your latest grinder booklet and tell me what allowance you will make on the Grinder I have now. This grinder is—

.....

(Insert make and model of Grinder you have on this line)

Name .....

Address .....

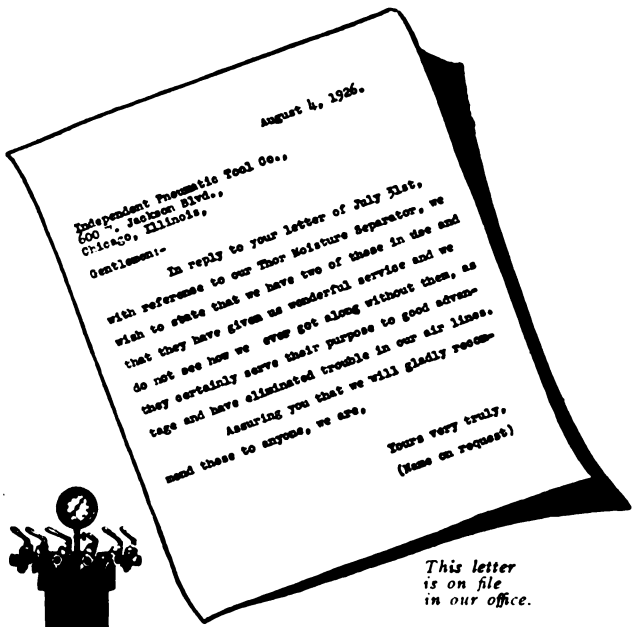
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Read what the Vice-President of a Large Company Said About the

Thor

MOISTURE SEPARATOR


August 4, 1926.

Independent Pneumatic Tool Co.,
600 W. Jackson Blvd.,
Chicago, Illinois.

Gentlemen:-

In reply to your letter of July 31st, with reference to our Thor Moisture Separator, we wish to state that we have two of these in use and that they have given us wonderful service and we do not see how we ever got along without them, as they certainly serve their purpose to good advantage and have eliminated trouble in our air lines.

Assuring you that we will gladly recommend these to anyone, we are,

Yours very truly,
(Name on request)

This letter is on file in our office.



Will Add Years to the Life of Your Pneumatic Tools

Particles of moisture and grit work havoc with your pneumatic tools as this firm will testify. It's best not to give these destroyers a chance to help scrap your pneumatics. A THOR Moisture Separator in your plant will be a silent, alert guard, protecting your pneumatic tools continually so that you can get the utmost use and efficiency from them. A small investment in this protector will pay mighty big dividends. Let us send you complete information and catalog.

We also manufacture the World Famous THOR Pneumatic and Electric Tools. Catalog on request.

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS — GENERAL OFFICES 600 W. Jackson Blvd. CHICAGO — ELECTRIC TOOLS

FACTORY AURORA, ILL.

Eastern Office 1463 Broadway, New York.

Low Pressure Air to Be Used in Copper Flotation

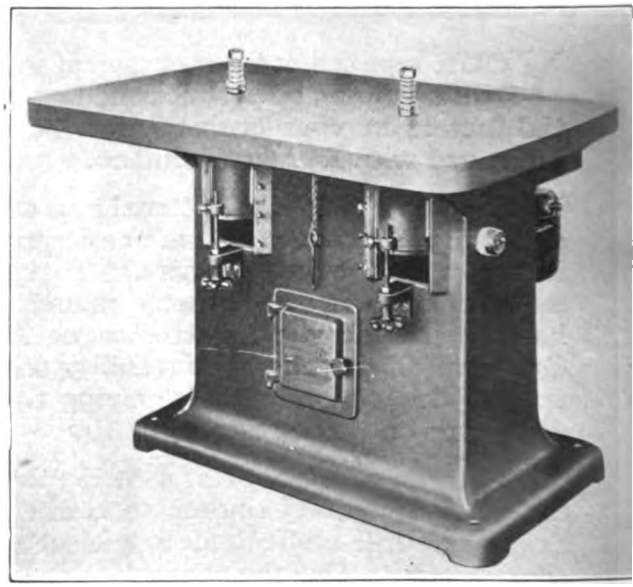
AIR at unusually low pressures will be used by the Nevada Consolidated Copper Co. for flotation purposes in milling copper ore. Two sets of motor-driven centrifugal compressors will be used for furnishing this air.

The compressors will be of General Electric manufacture and each will consist of a 1,250-horsepower synchronous motor driving a centrifugal blower rated 60,000 cubic feet a minute at 3.4 pounds equivalent sea level rating. At the altitude of the plant air will be delivered at 2½ pounds pressure.

It is said these will probably be the largest capacity machines ever made for this pressure, the usual pressure used for this work being in the neighborhood of five pounds. The machines will run at 3,600 r.p.m., the motors being direct connected and built into the blower, forming a complete, self-contained unit. The blowers will be of the single-stage type, occupying very little floor space, each unit requiring a space of but 11½ feet by 9 feet 7 inches. Power for the driving motors will be furnished by General Electric turbine generators, now located in the main power plant.

A Double Spindle Shaper

THE Gallmeyer & Livingston Company, of Grand Rapids, Mich., has recently placed on the market a new motor driven double spindle shaper. The table is 30 by 40 inches and the spindles are 20 inches apart. The yokes are fitted with extra capacity ball bearings and



are fitted into dovetailed ways with adjustment for changing the height as required.

Crucible carbon steel is used in the spindles which are provided with thrust bearings. These spindles are also fitted with chucks to use with either router bits or drills. Speeds of the spindles range from 7,200 to 9,000 r.p.m.

The machines are made with either of two types of motor drive. At speeds of 7,200 r.p.m. the shapers are equipped with 120 cycle motors on the spindles and for higher speeds ball bearing motors are mounted in a vertical position with direct belt drives to the spindles, without idlers.

... this issue write Industry Illustrated

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STANDARD TOOL CO.

The "Red Shield" is the latest achievement in the art of Drill making



With 46 years' experience

we pronounce the "Red Shield" the best drill yet produced.

It is a combination of Forged and Milled construction with correctly proportioned range of shanks to drive the Drill to fullest capacity.

Designed for all-around heavy duty

The "Red Shield" is imprinted on each Drill.

The chief points of merit are:

"High Speed Steel" of special analysis
Workmanship
Construction
Ample chip capacity
Size and strength of shank
Uniformity
Temper
Less breakage
More holes
Long service
Less grinding
Less cost per hole

THE STANDARD TOOL COMPANY

NEW YORK CLEVELAND CHICAGO



ROEPER Electric Hoists
with
Steel Plate Suspension

Two wrought steel plates in which drum shaft has its bearings, project above hoist, and can be extended and shaped to meet any requirement.

Write us for more details

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
Traveling Cranes Electric Hoists Trolleys



NO ACCIDENTS

Because the New Badger won't slip—it can't.

Its special crucible steel spurs grip and stick to the softer sides of the rail.

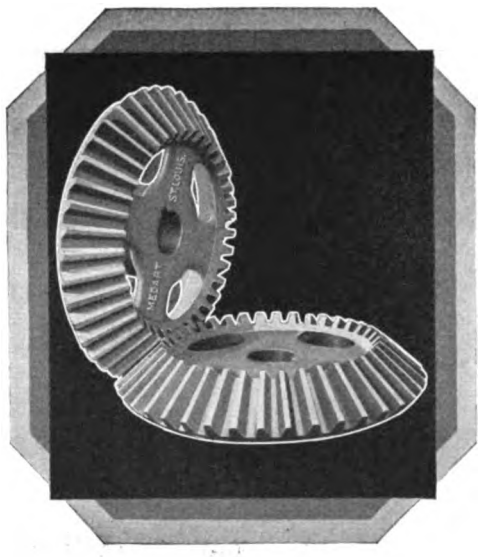
No wasted effort or half-hearted pushing for fear of slipping.

New Badger means quicker and safer car moving. Order from your Jobber.

THE ADVANCE CAR MOVER CO. Appleton, Wis.

New Badger
SLIP PROOF CAR MOVERS

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MEDART
GEARS

If you need gears—QUICK—call on Medart, St. Louis. Gear headquarters! Medart Gears are furnished in practically every type, material, construction and size:—Spur, Spiral, Bevel, Miter, Internal, Herringbone, Worm, Mortise (including wood cogs)—Pattern Molded, Machine Molded, or Cut-tooth—Cast Iron, Cast Steel, Semi-steel, Bronze and composition Fabroil, Textolite and Textoil.

Patterns unusually complete. "Right-now" special stock shipments or "special-rush-special-order" shipments.

Note:—Fabroil, Textolite and Textoil composition materials made by General Electric Company converted by gear-cutting into finished Gears by The Medart Company, national distributors.

Get Catalog 43 for
"Everything in Line Shafting Equipment"

Gearing is only one of the Medart line of "Everything in Line Shafting Equipment"—all listed in Catalog 43, in a concentrated, simplified form that makes transmission machinery buying easy and safe. Send for Catalog 43 and discount sheet.

THE MEDART COMPANY
(*Formerly Medart Patent Pulley Co.*)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
Office and Warehouse in Cincinnati
Manufacturers of Power Transmitting and Kindred Machinery

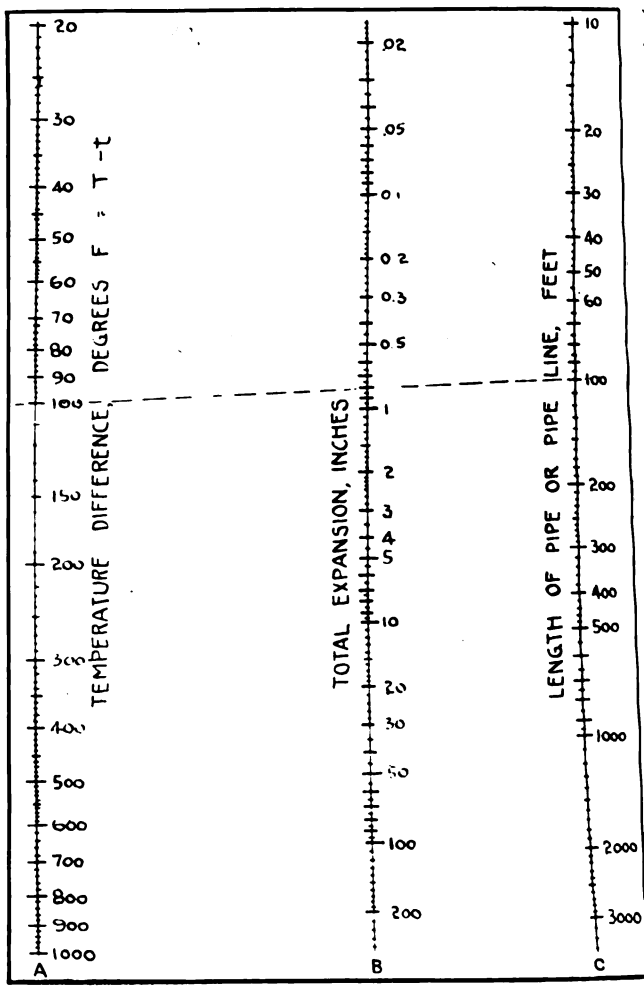
MEDART
Everything in Line Shaft

For pro

A Useful Expansion Chart

MANY power engineers and officials will find this chart useful for determining the expansion to be allowed in piping, rods, tubes, etc., for various temperature differences. This chart makes "longhand figuring" unnecessary.

To use the chart simply lay a straightedge across it once or stretch a fine black thread across, as indicated by the dotted line, and the problem is solved without further ado.



For example, a certain pipe line is installed which i 100 ft. long. It will be subjected to a temperatur variation of 100 deg. Fahr. What will be the total ex pansion in inches?

Connect the 100 deg. temperature difference, colum A, with the 100 ft. length, column C. The intersectio with column B gives the answer as 0.8 in. That's a there is to it. Very simple indeed.

Inversely the chart can be used for determining th allowable temperature difference where a definite amou of space is available for expansion and contraction. Thu if the length of the pipe is 100 ft. and the allowab expansion is 0.8 inch, the same line would show that temperature difference of 100 deg. Fahr. would be th limiting amount.

Also, if the factors in columns A and B are know he unknown in column C is immediately found. her words, if any two of the factors are known th

(*Continued on page 58*)

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NEW IDEAS

Your Milling and Grinding jobs—are they working 100%? It stands to reason that we have a few suggestions at Cincinnati which may be of help to you. The above department is a clearing house for ideas. You are welcome to them, at no cost. If we can speed up the production on your present equipment, we will be well pleased. If it means a new machine we will make the most conservative recommendations possible. We have a lot of new printed matter on Milling and better Grinding which we will gladly send you. Tear out this slip if you would like to have it—anyway we would like to know how many readers of this paper have seen this advertisement. You will do us a favor if you will send in this slip.

The Cincinnati Milling Machine Co.
Cincinnati, Ohio, U. S. A.

SEND ME SOME NEW IDEAS

☐ Milling ☐ Grinding

Name .....

Co. .....

Position .....

Address .....

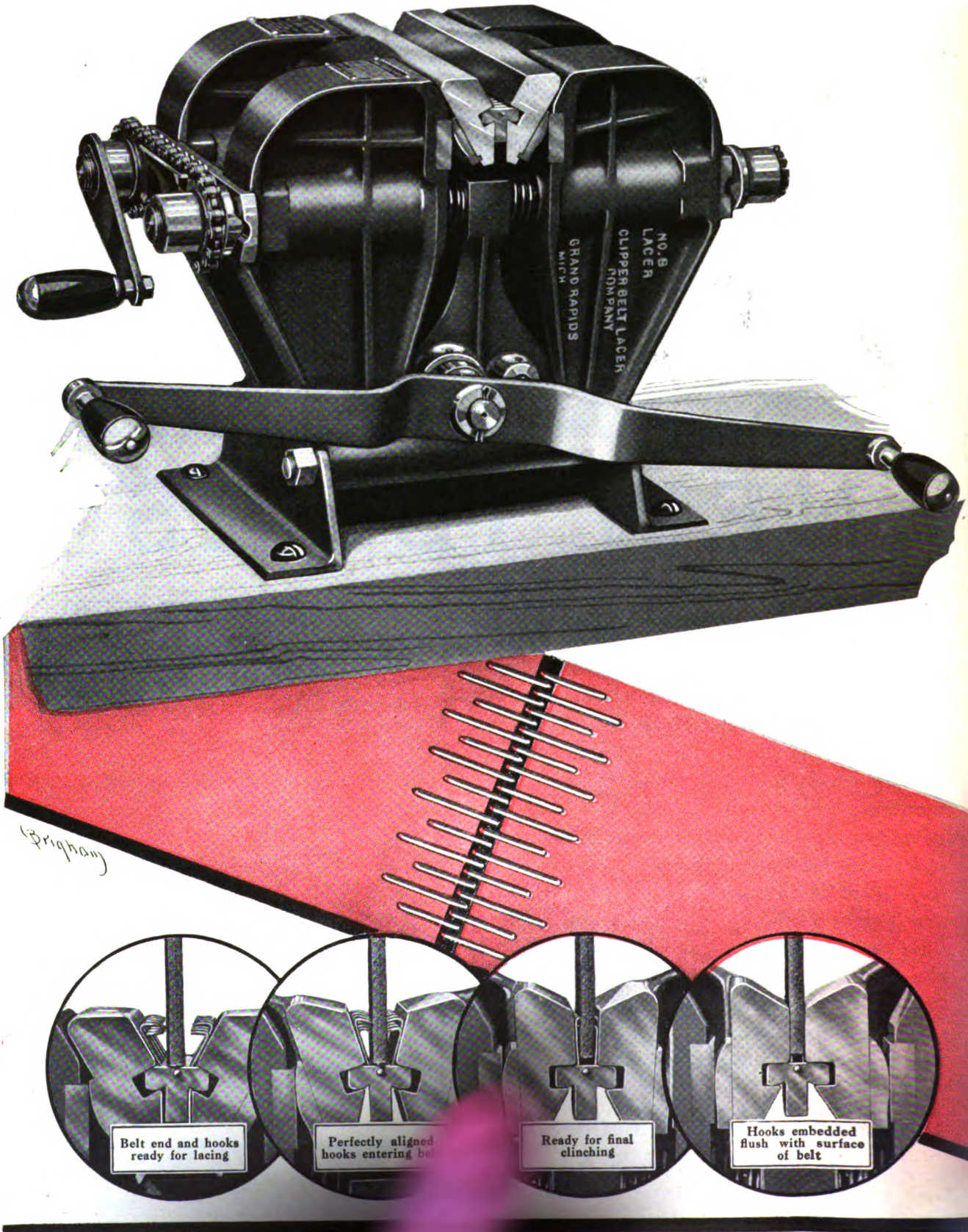
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The Clipper Trojan No. 8 Lacer

The Machine that Laces an 8 inch Belt in 1½ Minutes



For pr... issue write Industry Illustrated

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A New Clipper Lacer

A Three-quarter turn of a crank—and the powerful jaws of this new lacer force a row of Clipper Hooks cleanly and uniformly into an eight-inch belt. Less than 1½ minutes is required to lace both ends of a belt.

A pressure of 45,900* pounds on the belt is developed by an entirely new principle, embedding the hooks in perfect alignment absolutely flush with the surface, thus prolonging the life of the lacing and reducing the wear on the hooks and pulleys to a minimum. And it will lace even the smallest belt with increased efficiency and economy.

Industrial plant superintendents will immediately appreciate the value of the new Clipper Trojan No. 8 Lacer to their plant operation.

The Clipper Trojan No. 8 Lacer is furnished with or without stand. Weight 100 pounds. For complete demonstration and prices communicate with your nearest Clipper dealer, or with the

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN

QUALITY Clipper BELT LACING

*These figures were determined by actual tests made in the laboratories of the Worcester Polytechnic Institute by Prof. Francis W. Roys, Head of the Dept. of Mechanical Engineering.

Clipper

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WITT CANS ARE THE KIND YOU NEED

You should not expect an ordinary can to serve your purpose. For "heavy duty" service, the light gauge, spot welded kind won't stand the gaff.

From the basic material, special analysis steel, to the heavy hot-dip galvanized coating, Witt Cans are made to withstand severe service and abuse.

The method of corrugating does not break down the molecular structure as with ordinary corrugations. Body is interlocked with the bottom, and reinforced with heavy, one piece solid beaded steel bands at top and bottom, and riveted (not spot welded), hot-dip galvanized after entirely completed, water-proof and fireproof, the Witt Can defies rough usage, and is still on active service long after the ordinary can has been discarded.

Progressive industrial institutions everywhere are using them—why not give them a trial? Phone your jobber or write

THE WITT CORNICE COMPANY
2117 Winchell Avenue
Cincinnati, Ohio

Manufacturers of

WITT
CORRUGATED
CANS and PAILS

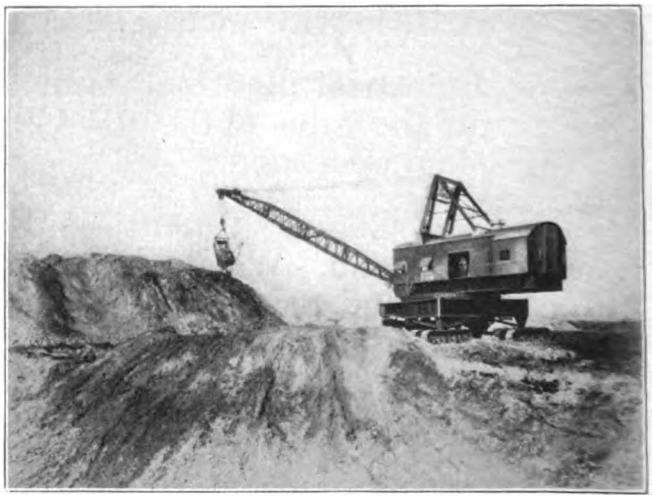
(Continued from page 54)

third is very quickly found, and without any computing whatever.

It will be noted that the range of the chart is wide enough to take care of almost any expansion or contraction problem that the engineer may have to contend with. The temperature difference, column A, varies all the way from 20 deg. to 1,000 deg. It is very seldom, if ever, that we have as high a temperature as 1,000 deg. The length of pipe line, also, is great, varying all the way from 10 ft. to 3,000 ft., or more than half of one mile. And the total expansion between these limits varies all the way from 0.02 in. to 200 in. It is interesting to note that if a pipe line were 3,000 ft. long, with a temperature difference of 1,000 deg. the expansion would be over 200 inches.

A New Six-Yard Stripping Shovel

A NEW six-yard stripping shovel, readily and conveniently convertible into a dragline, has just been announced by the Bucyrus Company, Milwaukee. This new stripping shovel is called the 200-B and like the 320-B, is equipped with box-girder boom and outside dipper handles. The 200-B is built for faster digging on jobs where a smaller revolving shovel is not rangy enough, and where an eight-yard shovel is larger than needed.



The type of boom on the new machine is much lighter than a split-boom of equal strength—and it is especially adapted to withstand the severe bending strains and tortional loads.

This construction is said to permit of operation with less counterweight, which in turn is said to reduce the flywheel effect frequently encountered and therefore the shovel can swing surprisingly fast.

The change from a stripping shovel to a dragline, in a 200-B, can be made by a few minor adjustments in the main machinery, and a change in the boom equipment. As a dragline, the 200-B is constructed to be especially adapted for digging or stripping ore, coal, and phosphates.

The 200-B may either be mounted on four wheel trucks or caterpillars, according to what the individual specifications demand. Both types of mountings have three point support which reduces the load and wear on the trucks when the loaded dipper swings over the corner of the base.

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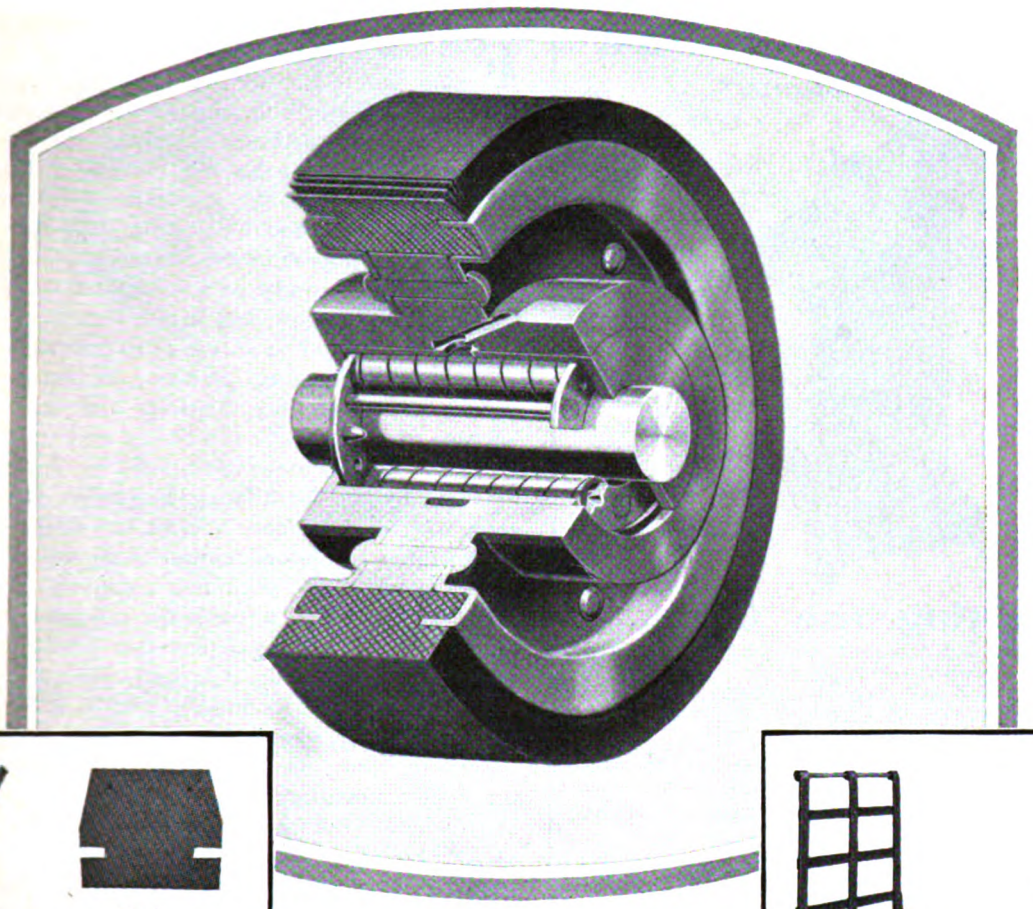




Fig. 1 Fig. 2

These tires consist of layers of cotton duck (Fig. 1) hydraulically compressed between steel plates. The warp and woof of the duck run diagonally crosswise of the wheels (Fig. 2), and only the ends of the threads are presented to the wearing surface—for greatest durability



Canvas-Cushion Treads Outlast Rubber 10 to 1

Divine Canvas-Cushion Truck Wheels combine the great durability of iron or steel with the quietness of rubber. They also give absolutely 100% floor protection. Unlike rubber they cannot chip away or be damaged by cuts or bruises. They are not affected by oil or grease.

Because of their exclusive features Divine Canvas-Cushion Wheels outlast rubber tired wheels 10 to 1 and more. Made in all standard diameters; either plain, ball, or roller bearings. Send to-day for further information about these remarkable wheels.

Divine Brothers Company
INCORPORATED
Utica, N.Y.

DIVINE *canvas cushion truck* WHEELS

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Union Universal Saw

"Giant in Volume"



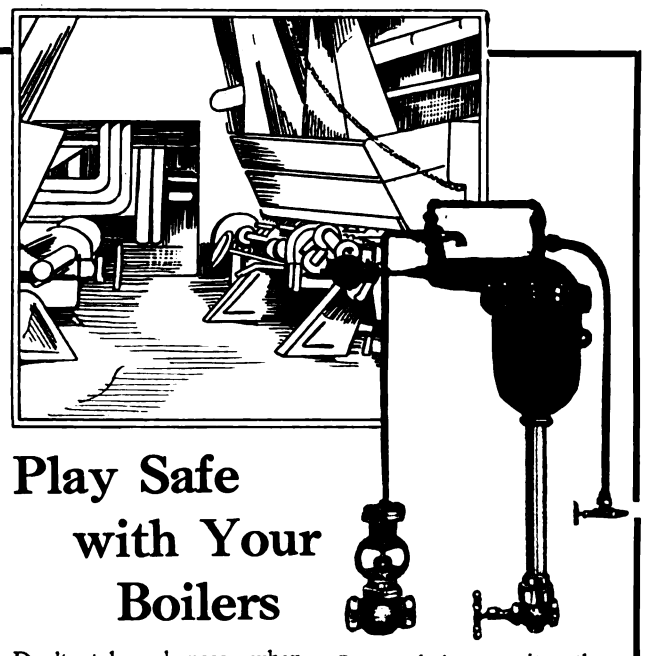
Counting the Cost

Durability, speed and accuracy are the first essential requirements of a woodworking machine. A machine that gives you this and one thing more, LOWER OPERATING COSTS, MEANS GREATER PRODUCTION AND GREATER PROFITS.

Every Union machine meets fully these first requirements, and in addition will do your work at less cost. Before you buy, let us explain the advantages of Union Machines.

GALLMEYER & LIVINGSTON CO.

412 Straight Ave., Grand Rapids, Michigan



Play Safe with Your Boilers

Don't take chances when costly equipment and human lives are involved.

Vigilant Feed Water Regulators control the proper water level of the boiler feed water. They are entirely independent of the human element.

Operated by gravity—there are no floats, tubes or diaphragms to get out of order. For real boiler and fuel economy Vigilant Regulators have no equal.

It will pay you to write and get full information.

The Chaplin-Fulton Mfg. Co.

28 [illegible]n Ave., Pittsburgh, Pa.

Boiler Rating Method Proposed

FOR some time the matter of rating low pressure heating boilers has been in a chaotic condition and has been unsatisfactory to engineers, architects, manufacturers and contractors throughout the country. The situation was noted by the United States Bureau of Mines and called to the attention of the American Society of Heating and Ventilating Engineers as a most disturbing condition in the industry. The Bureau suggested the appointment of a committee to study the situation from all angles, and urged the Society strongly to take up this matter in an effort to provide a satisfactory solution of the rating question, particularly as the repeated efforts of manufacturers and others had failed because of competitive conditions and trade jealousies.

As a result of these conditions the American Society of Heating and Ventilating Engineers has appointed a committee to formulate a plan for rating such boilers. No member of this committee is in any way connected with the trade and each has accepted the difficult job of finding a solution to the boiler rating problem with the thought of establishing a plan that would be to the best interests of the public at large. Several meetings have been held and on December 8 and 9, 1926, all day conferences were held and a working plan adopted which is now being sent out in a letter from the committee to the boiler manufacturers of the country in order to learn whether the trade really wants to have this unsatisfactory boiler rating condition cleared up and a uniform standard of rating established, or whether the manufacturers prefer the present conditions to continue.

More Than Half Billion Lamps in 1926

WELL over a half billion incandescent lamps, including 315 million "large" lamps and about 205 million miniature lamps, were sold in the United States in 1926. These quantities represent the greatest annual increase in the history of the lamp industry during its almost half century of existence, says John Liston of the General Electric Company in his annual review of the electrical industry. The increases over 1925 sales amounted to 12½ per cent. in the case of the large lamps and five per cent. in the case of the miniature ones, for automobiles, flashlights, etc. In addition, the present prices of incandescent lamps are the lowest in the history of the industry, the list prices of the large mazda lamps having been reduced an average of 2½ per cent. on February 1, and an average of four per cent. on September 1.

"It is estimated that, throughout the remainder of the world, the number of large lamps used is about equal to the quantity used in this country, and that the total of miniature lamps is about one-quarter the number used here," says Mr. Liston. "Thus the present annual sales of all kinds of incandescent lamps throughout the world would aggregate about 900 million lamps."

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For an Even Flow of Power with Longer Belt Life



PYOTT

Red Face Pulleys

CAST IRON PULLEYS are a specialty in spite of all that may be said to the contrary.

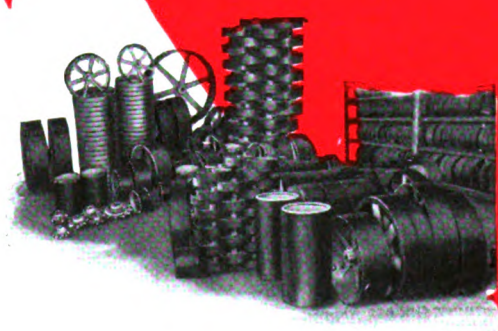
Cast Iron Pulleys are used for hundreds of different purposes.

Certain pulleys are better fitted for one purpose than others—Different requirements necessitate different construction.

Only one who has given years to study and experiment in the manufacture of pulleys can competently meet these diversified demands and requirements.

Pyott Red Face Pulleys are the results of a quarter of a century of specialization. They are the BEST in iron pulleys that the industry can produce.

Thousands of patterns on hand, making immediate delivery of any specification or requirement possible.



PYOTT FOUNDRY CO.

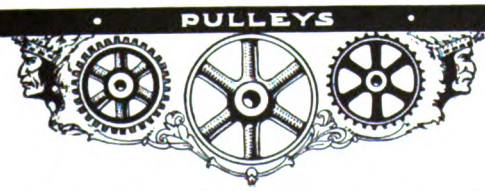
Makers of quality pulleys for over a quarter of a century

332 N. Sangamon St. Chicago

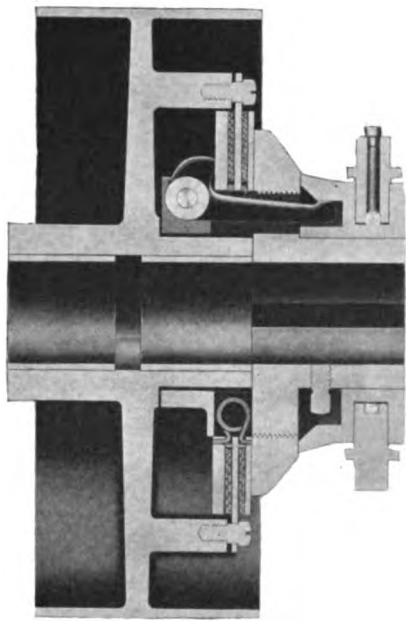
Branches: **New York, N. Y., Milwaukee, Wisc., Buffalo, N. Y.**

PYOTT POWER WHEELS

· GEARS · · PULLEYS · · SPROCKETS ·



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and Now—

The Conway

Disc Clutch

After many years of experimentation and tests, we have brought out the Conway Disc Clutch that carries out the Conway idea of less space for more power. The new Conway Disc Clutch has the following salient features:

1 The clutch presents only a finished cylindrical contour.

2 There are no flying bolts, toggles, levers or pins.

3 The actuating parts are completely enclosed, yet the adjustment is handy and plentiful and clamps tight, being a simple split ring with a smooth finished surface.

4 The levers are alloy steel with a large factor of over strength. Their under slung position permits a large lever ratio which requires only slight pressure for engagement.

5 Centrifugal force would disengage the clutch when the cone is withdrawn, even if there were not springs forcing the plates apart. Vibration cannot cause the cone to withdraw, as this part is machined with a proper deflection angle.

6 A unique process of treating the key surfaces has practically eliminated wear in the splines.

7 The clutch is probably the quickest and easiest disassembled unit of its kind produced.

8 All discs are treated steel with woven asbestos lining, with ground faces as standard production.

9 The body of the clutch is counter bored to permit the pulley hub to extend under the point of frictional driving contact, which, also, saves considerable shaft space.

10 The clutch is inherently balanced.

We are ready to send descriptive matter and complete information.

THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio

The New Bass Industrial Broom

AFTER months of experiment and testing based on over thirty years' experience, the Osborn Manufacturing Company of Cleveland has introduced the new Osborn Bass Broom.

It has a seamless steel cap which makes possible an unusual combination of desirable qualities into a unit broom that is almost indestructible. It is comparatively light and well balanced. This light stamping holds the fiber permanently. First tremendous pressure shrinks the steel around the fiber and holds it firmly by compression. Second, the cap is nailed to prevent the fiber from loosening, and third, is filled with a special cement which gives the final assurance of a broom which it is said will not come apart or loosen.

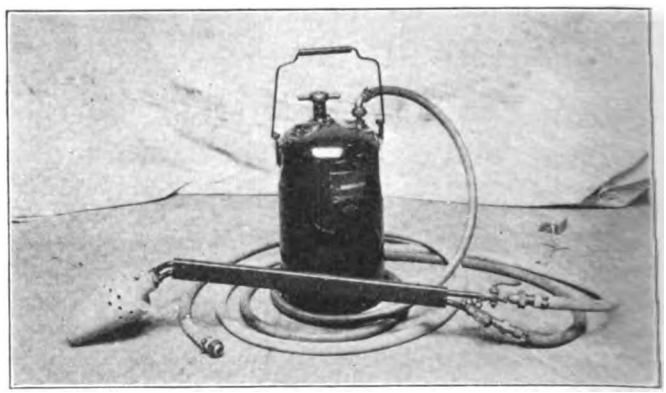
Three bearing points keep the handle permanently rigid—a close-fitting collar on the seamless steel cap and two heavy rivets through both the cap and the handle. Each handle is of selected straight grained hardwood.

By the use of full weight of specially mixed bass fiber which combines the right flexibility with toughness and durability offers long wear. The correct trim makes sweeping easy and thorough.

Three grades of brooms are made. The coarse broom is designed for heavy sweeping and railroad track work. As a special track broom it is supplied with a chisel handle and one wire band. For general factory and warehouse sweeping the medium grade is as nearly perfect as a broom can be. And for lighter work the more flexible fine grade sweeps clean.

An Oil-Burning Torch

HAUCK MANUFACTURING CO., of Brooklyn, N. Y., placed on the market recently a new venturi suction oil-burning torch. It is made in two sizes; the smaller being portable and the larger mounted on a two-wheel truck.



In this torch, it is claimed, the oil is not under pressure, thus eliminating the possibilities of personal injury or fires, due to bursting tanks.

Nozzles of different kinds may be had for various use and these are connected to the tank and to the air supply in the usual manner by rubber hose.

The tank is of seamless drawn steel, with all connections either welded or brazed. It has a ball check valve in the filler cap which seals the tank when it is tilted or upset.

ot advertised in this issue write Industry Illustrated

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"HALLOWELL" ALL-STEEL Factory Equipment

ready-made benches cost less!



HERE you see a "Hallowell" All-Steel Work Bench that needs no carpenter's costly time. It won't splinter. It can't burn. It's far ahead of any wooden bench for wearing qualities. All-Steel Benches come in various sizes to fit every factory need and *they are always in stock* so you can have them when you want them and in any number, too!

IF you prefer wooden tops—"Hallowell" Steel Bench Legs are at your service. They save time and much money. No bench can get wobbly when built on "Hallowell" Steel Bench Legs.

Our All-Steel Tables, Steel Bench Drawers, with or without locks, and Steel Tool Stands, mounted on casters might be just what you are looking for.

WRITE today for our special folder that gives complete description of these various items and illustrates our All-Steel Benches, too! At the same time, we'll be glad to send you our complete factory equipment catalog.

Write for circulars, to-day!

Standard Pressed Steel Co.

Box 8, Jenkintown, Pa.

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Four Wheel Brakes ~ On the Vise!

A turn of the bolt—the base is locked! As quick and positive as four wheel brakes in an emergency. Nor is that all. You will find this type of locking feature on the Parker Vise only—an exclusive patented feature which gives the Parker Swivel base a big advantage over all others.

When the bolt is turned down the wedge is pulled up, expanding the split ring with a positive grip around the whole 360° of the base.

Write to W. R. B. for Catalog 57B

Other Exclusive Features of Parker Vises


Solid Underportion in Slide


Renewable Steel Jaws


Swivel Base 360° Gripping Power


Handle Stays Put

PARKER VISES

Meriden, Conn.

GRIP LOCK GRIZZLY

Screw "LENOX" Drivers



Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

Points are heat treated to stand the strain without bending. And the handles cannot loosen.

Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

AMERICAN SAW & MFG. CO.
Springfield, Mass.
"The Tools in the Plaid Box"

Controlling the Manufacture of Hydrogen and Oxygen

IN order to eliminate the possibility of mixing gases, and for the purpose of minimizing damage from accidents, the Magnolia Gas Products Company, Houston, Texas, has installed a particularly complete control switchboard with the necessary governing devices. This company manufactures hydrogen and oxygen by the electrolytic process, using a booster type rotary converter and motor generators.

Originally the various control panels were scattered in isolated positions around the plant floor. These are now all combined in a long switchboard on a balcony over the rotary converter and motor generator equipment, a total of twenty panels being used.

In order to prevent any mixing of the two gases through reversal of the current, a reverse power relay is used which shuts down the equipment when the current changes its direction of flow. As a further provision in case of accidents, an emergency push button is used. Depression of this button first opens the air circuit breakers and afterwards the main incoming-line oil circuit breakers. The push button actuates an instantaneous undervoltage relay equipment to accomplish this result.

One relay is arranged to de-energize the undervoltage release on the air circuit breaker and thus open the breaker, when the relay coil is de-energized. When this de-energizing occurs, a second set of contacts is closed, de-energizing an instantaneous relay located on the main incoming-line panel. This, in turn, opens the circuit of the low-voltage release on the incoming-line panel. Thus, when the push button is depressed the voltage relays on the direct-current panels drop and open the air circuit breakers. The rotary panel voltage relays then energize the alternating current panel voltage relay and open the main breaker.

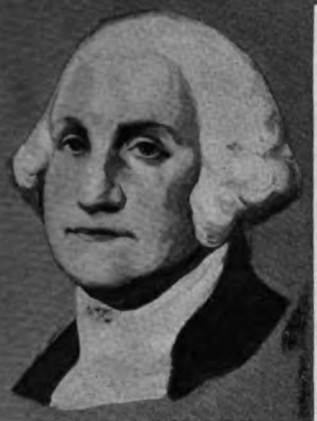
By this method, any possibility of overspeeding the machine, reversing polarity, etc., is avoided because all the direct-current air circuit breakers will open before the alternating-current oil circuit breakers. When leaving the plant, the operators merely have to push the button and the plant will shut down until their return.

Another interesting feature of this installation is the fact that all power for machines, lights, etc., is metered on the watt-hour meters on the incoming-line panels. An emergency throw-over equipment, located behind the switchboard, is so arranged that the two small lighting transformers are connected ahead of the main incoming line oil circuit breakers. Thus, in case of emergency when the main incoming-line oil circuit breaker is open the throw-over equipment will throw a few of the pilot lights on the emergency stand-by transformers, thus giving sufficient light to make any inspections necessary.

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FAMOUS SEXTETTES



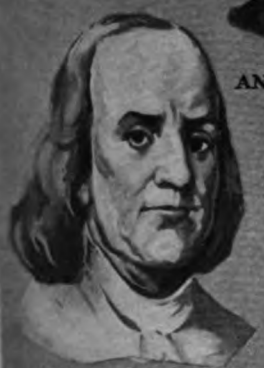
GEORGE WASHINGTON



ABRAHAM LINCOLN



ANDREW JACKSON



BENJAMIN FRANKLIN



ALEXANDER HAMILTON



THOMAS JEFFERSON



6-FAMOUS AMERICANS

The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

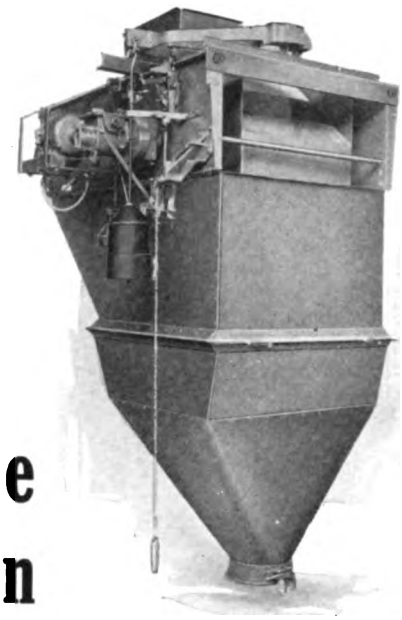
Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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RICHARDSON

Automatic Sacking Scale

For Granular and Crushed Products



One Man

Weighs and Sacks 5 Sacks per Minute

This type of Richardson Automatic Sacking Scale used at Carnegie Steel Company, Jones & Laughlin Steel Company, Youngstown Sheet & Tube Company and in other large plants is saving labor costs and doubling the output formerly obtained in the handling of Ammonia Sulphate—a by-product of their coke-ovens.

With the Richardson Automatic Sacking Scale it is now possible to weigh, fill, sew and truck to storage or cars as many as 240 to 300 sacks of Ammonia Sulphate per hour—always saving 1 to 2 men.

This scale weighs automatically net into sacks in exact predetermined amounts. Each sack contains the exact amount—no overweights or short weights—it has entirely eliminated customer disputes.

If you are sacking Ammonia Sulphate, Flake Chloride, Soda Ash, Sulphur, Salt, Slate, Gypsum, Fullers Earth, Glue, Copra, Feldspar, Charcoal, Coke, Potash, Plaster, Nitrates, Clay, Lime, Paint Pigments, Sodium Bicarbonate, Fertilizers, etc., let us tell you how you can save labor costs in handling and sacking—increase your output and assure absolute accuracy in weighing.

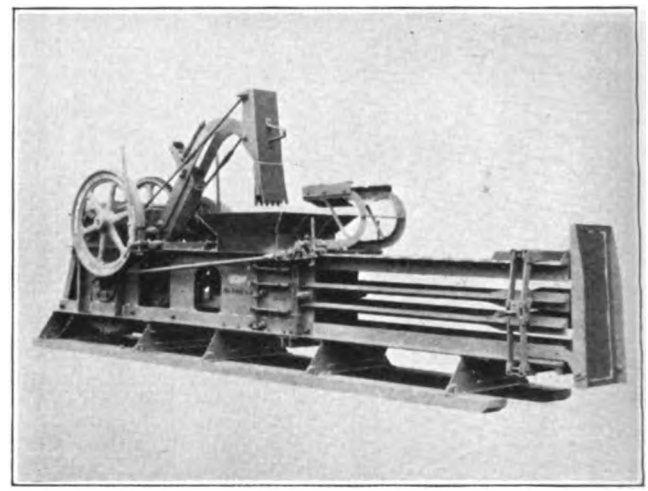
RICHARDSON SCALE COMPANY

Clifton, New Jersey

New York Buffalo Chicago Boston Minneapolis
Gulfport Wichita Omaha Los Angeles Pittsburgh

New Paper Baler Made of Welded Steel

THE new type of baling press for baling waste paper, scrap from textile mills, etc., shown in the accompanying illustration is made by The Ohio Cultivator Company, of Bellevue, Ohio. Riveting of the structural members has been entirely replaced by electric arc welding. It is claimed that one of the principal difficulties with baling machinery has been eliminated by this type of construction. Using riveted construction, during the use and abuse of the equipment the rivets were likely to work loose. On the other hand, it is stated that in the welded design, the welded joints have been made so much stronger than the strength members that it would be necessary to wreck the whole machine before the joints would work loose or fail. To make the various parts of the machine replaceable, some bolted joints are used so that the machine can be taken apart.

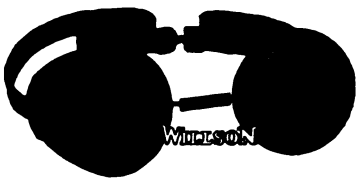


The Ohio Cultivator Company has developed a wide field of usefulness for welding in the manufacture of agricultural machinery and baling presses. A number of pieces formerly made by use of gray iron castings are now made of pieces of steel welded together. The advantage claimed is that the equipment can be built in welded steel with less weight and that it will not break in service. Careful inspection methods are followed to insure each weld made against defective workmanship, in spite of the fact that the weld is designed for more than twice the factor of safety usually allowed in riveted steel construction.

"AS a factor bearing on the probable future trend of business, the slow downward movement of prices appears to strengthen the outlook for a continuation of prosperity. In some directions, no doubt, confidence will be impaired and enterprise restricted by the gradual decline. Such a slow recession, however, threatens little in the way of inventory losses, particularly at a time when business concerns in general are carrying on a very large volume of business with the minimum of investment in stocks of goods. The absence of price appreciation certainly reduces the incentive to speculative buying, a practice which could easily result in disaster under present conditions, with the country's gold reserve at an abnormally high figure and subject to enforced reduction at any time."—*The Guaranty Survey.*

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Eye Protection at Its Best



Welding and Cutting Goggle, No. L80. Tough fiber eyecups, adjustable bridge, indirect ventilation, and Industro Glass. $18.00 per dozen, $1.50 per Sample goggle, f. o. b.



Electric Welding Helmet No. 130. Strong light-weight fiber. Industro Glass with cover glass—can be changed in an instant. $9.30 each, f. o. b.

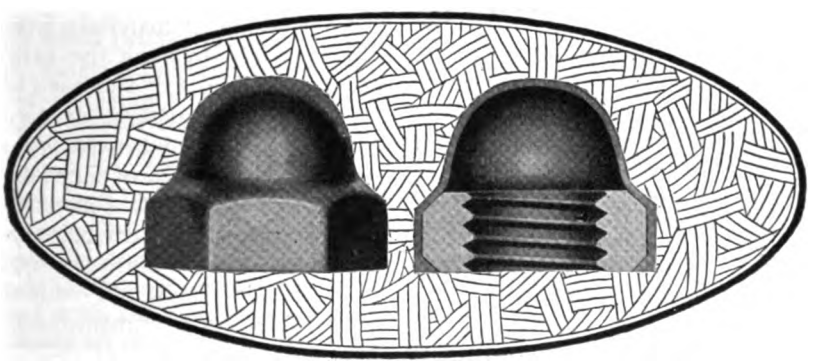


Safety Goggle No. LJ31½. For chipping, scaling, rivetting, grinding, etc. Can be standardized for both heavy and light work. Super-Tough Glass. Sweat-proof padding. $17.40 per dozen, $1.45 each, f. o. b.

WILLSON GOGGLES, INC., READING, PA.

Manufacturers of safety goggles, welding helmets and handshields, and Dustite Respirators. Types for every industrial need.

Ask for our catalog today,—you may need it tomorrow.



In addition to the Ferry Patented Brass and Nickel Silver Covered Acorn Nut

We announce

A New Steel Covered Acorn Nut Patented by Ferry

BECAUSE of its construction, this new Acorn Nut is recommended for strength and durability.

It has the added advantage of permitting painting, galvanizing, Parkerizing, Sheradizing, Cadmium-plating, Nickel-plating, burnishing, polishing, and buffing.

Comes in sizes ¾" across flats and tapped ¼", 5/16", ⅜", 7/16", and ½". Also in sizes 15/16" across flats and tapped ½", 9/16", and ⅝".

Send Coupon Today

Send for your sample of this new patented Ferry All-Steel Covered Acorn Nut—let us tell you more about its advantages and low cost. Fill in the coupon below and mail today.

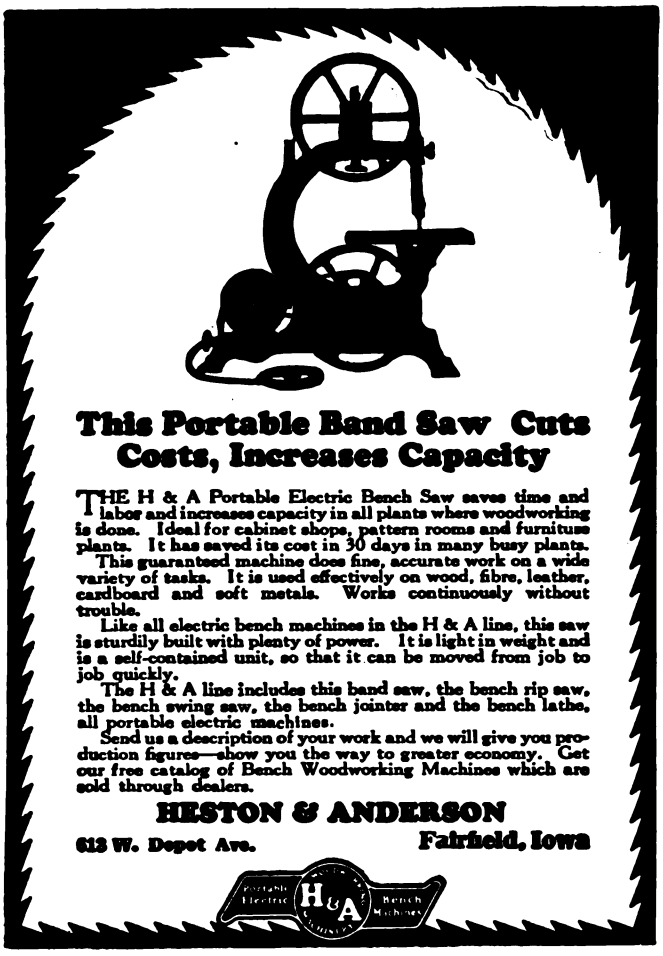
FERRY
PROCESS SCREWS

THE FERRY CAP & SET SCREW CO.
2151 Scranton Road - Cleveland, Ohio

Please send us sample of your new Ferry All-Steel Covered Acorn Nut, together with further information and prices.

*Size*_____ *Material*_____
*Tapped*_____ *Finish*_____
*Name*_____ *Position*_____
*Firm*_____
*Street*_____ *City*_____ *State*_____

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This Portable Band Saw Cuts Costs, Increases Capacity

THE H & A Portable Electric Bench Saw saves time and labor and increases capacity in all plants where woodworking is done. Ideal for cabinet shops, pattern rooms and furniture plants. It has saved its cost in 30 days in many busy plants.

This guaranteed machine does fine, accurate work on a wide variety of tasks. It is used effectively on wood, fibre, leather, cardboard and soft metals. Works continuously without trouble.

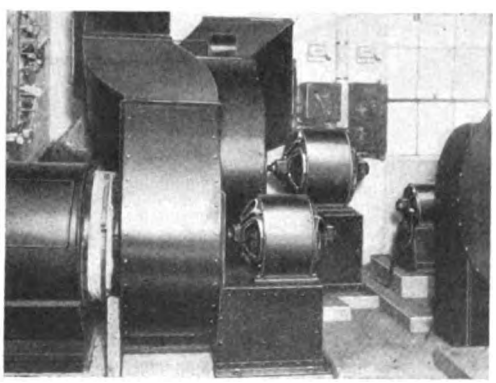
Like all electric bench machines in the H & A line, this saw is sturdily built with plenty of power. It is light in weight and is a self-contained unit, so that it can be moved from job to job quickly.

The H & A line includes this band saw, the bench rip saw, the bench swing saw, the bench jointer and the bench lathe, all portable electric machines.

Send us a description of your work and we will give you production figures—show you the way to greater economy. Get our free catalog of Bench Woodworking Machines which are sold through dealers.

HESTON & ANDERSON

613 W. Depot Ave. **Fairfield, Iowa**



A few of the many Diehl motors installed in the Boston City Hospital for operating Ventilating blowers.

DIEHL MOTORS

A battery of Diehl motors are used to operate the ventilating blowers in the large new maternity hospital in Boston, Mass. Diehl motors were chosen for their dependability—for hospital ventilation must be maintained at all times. Diehl motors assure the Boston City Hospital a constant supply of clean, fresh air.

We will be glad to send those interested complete information covering the application of Diehl motors for driving general and special machinery of every kind. Let Diehl engineers help you with your power problems.

Write for descriptive bulletins—now

DIEHL MANUFACTURING CO.
ELIZABETH, N. J.
Atlanta Boston Chicago Detroit New York Philadelphia

DIEHL

BUILDERS OF FANS AND MOTORS SINCE

For produ[illegible]



Recent Advances in Industrial Transportation Methods

By G. M. Stevens

OUR OWN TIMES have undergone the greatest transformation in industrial methods that man has yet accomplished. We have seen the handicraft arts practically disappear and have seen machine industry, mass production, and factories of unbelievable size take their place.

This has been a direct result of the vast change in the transportation system throughout the country, resulting in continued growth and greater outlet for goods manufactured.

To cope with the increased demand for goods manufactured and to meet competition, has resulted in industry becoming closely specialized, and this in turn tends toward specialization of equipment. As a result machine processes are today in a high state of development. All operations are arranged in logical sequence. Each element of product passes through the factory by the same route and by the same processes. An arrangement of this kind is known as "continuous process manufacturing." It represents the extreme of specialized industry. At the other extreme is the old type of factory which makes many kinds of articles, but to order only, and without any continuity in manufacturing.

One of the problems of a large industrial unit today is the handling of materials from the point of incoming raw materials, through the various manufacturing processes, to the point of shipment of completed goods without excess of handling or tie-up of excess material resulting in increased inventory.

The accumulation of inventory in process of manufacture makes a constant increase in process of apparatus manufactured and extraordinary efforts are being made to eliminate or to reduce the materials in process. As a result, and in connection with the equipment known as "continuous process manufacturing," various methods of handling the different classes of materials manufactured have been developed.

1. *Belt Conveyors* are made of fabric belts, usually rubber covered, and are best suited for light or medium weight articles that will not injure the belt, to be conveyed in quantities at a given speed between two points or through a sequence of operations. They can be used for either long or short distance transport. They are sometimes used two in parallel, one belt carrying raw materials to machines and the second belt carrying away the finished product. They are also used as two-way conveyors, where tote boxes or trays are used: one belt carrying boxes or trays with materials to machining operations; the second belt carrying empty boxes or trays back to starting point.

2. *Chain Conveyors* of the push bar type or slat type are made consisting of blocks of wood attached to one or more strands of chain or hinged bars running over sprockets. These are used for the handling of heavier materials such as castings, heavily loaded boxes, where a definite speed is required between two

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Good Will Builders









GOOD WILL—that much discussed, intangible, but very real factor which can make or break a business—is available in forms so commonplace that they are often overlooked. Shipping boxes—for example.

Some shippers regard their packaging as incidental—others (more foresighted) use it to cultivate the good will of their customers and, incidentally, to insure repeat orders.

When a product is packaged in a cumbersome, old-fashioned or inferior box, forcing customers to pay excessive freight costs and enter frequent damage claims, customer good will is impaired or destroyed. Further efforts by the salesman are handicapped and may even prove useless.

On the other hand, when a product arrives in a compact, light, easily-handled container which takes advantage of the lowest freight costs and occupies a minimum of storage space, the good will initiated by the salesman is multiplied. Repeat orders come easier after each shipment.

Hinde & Dauch corrugated fibre shipping boxes are good will builders. Engineered for compactness, convenience and safety—they are built of the finest materials and with the utmost care and effect worth while savings in shipping room personnel, packing time and shipping costs. That's why over 4000 shippers each year entrust their packaging problems to the H & D Package Engineers.

This H & D Engineering Service is available to all—without cost or obligation—for the solution of every packaging problem with H & D Corrugated Fibre *Good Will Builders.* Send the coupon today.

THE HINDE & DAUCH PAPER COMPANY
299 WATER STREET SANDUSKY, OHIO
Canadian Address: Toronto: King Street, Subway and Hanna Ave.
The World's Largest Producer of Corrugated Fibre Shipping Boxes and Packaging Materials



Send for a Package Engineer He KNOWS Packaging

H & D Engineering Service gives its expert help without cost to over 4000 shippers each year thru its 40 Package Engineers. **The coupon will bring one to you.**



THE HINDE & DAUCH PAPER CO., 299 Water St., Sandusky, Ohio

Please have a Package Engineer call ☐

Send me copy of booklet, "How to Use H & D Free Service." ☐

Name of Company _____

Name of Writer _____

Street Address _____

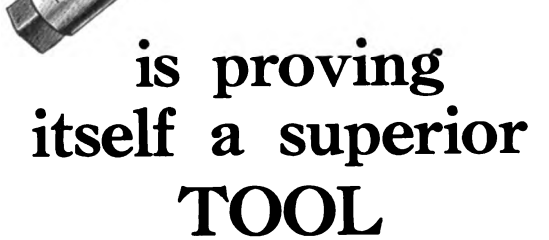
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The New MORSE No. 717 Spiral Fluted Expansion Reamer



is proving itself a superior TOOL

The Spiral flutes make it easy free cutting and if there is a longitudinal slot, keyway or chamber in the hole the reamer does not catch or chatter. It has a long guide and is especially adapted for reaming piston pin holes. It is easily adjustable to a few thousandths oversize and you will find it a very handy and useful tool.

Try one out on your next job and watch results

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Morse High Speed and Carbon Drills, C Reamers, Taps and Dies sold by reliab everywhere.

points or through a sequence of operations and are suitable for movement of materials up or down or horizontally.

3. *Gravity Roller Conveyors* are a series of cylindrical rollers revolving generally on ball bearings, but where a more sluggish gravity action is required the ball bearings are omitted. Gravity conveyors can be used for either light or heavy materials and where the time of conveying is not an important factor. It is also an advantage in cases where small storage is required ahead of various operations.

4. *Compressed Air Chute Conveyors* are cylindrical tubes through which flows a steady current of compressed air of high enough velocity to carry materials that are light in weight. They can be used for long or short distances and can be run in any direction and are principally used on large quantity production.

5. *Gravity Friction Slides, Chutes* or *Spirals* are made of metal, wood or fabric, and are generally used for conveying packages of average size where there is not too great a difference in frictional contact.

6. *Overhead Track* of I-beam type to which the suspended baskets or hooks are fastened by wheels on each side of lower I-beam flanges are usually employed for assembling a number of parts as one unit. Ordinarily these are suspended to gain floor space and also have the advantages of being adjusted to proper working height. For assembly operations they are usually pushed by hand.

7. *Overhead Chain Conveyors* consist of pivoted suspended trays, attached to two strands of endless chain or cable running over sprockets or sheaves. These are power conveyors and are run at a definite speed in any direction. They are adaptable for all classes of work where economy of floor space is desired. This type of conveyor is particularly adaptable for mass assembly and for delivery of parts to assembly operations as needed.

8. *Troughed Belt Conveyors* are usually made of fabric, rubber covered, which travels over a revolving type of idler which bends up edges of belt. This type of conveyor is used for handling materials in bulk, such as sugar, sand, coal, coke, etc., at a given speed in any direction, and for short or long distances.

9. *Escalator* or *Heavy Type Slat Conveyors* are used for lifting or lowering on incline, heavier materials such as castings, or loaded trucks, from one elevation to another, and can be used to great advantage in loading or unloading at a shipping or receiving platform.

10. *Jib Cranes* and *Monorails* equipped with electric or air hoists can be used for quick transfer of heavy materials from any type of conveyor to machines.

11. *Lift Trucks,* hand or power propelled, can be used to advantage where no great volume of specialized work has to be handled and where many kinds of articles are manufactured.

12. *Storage Battery* or *Gasoline Motor-Driven Industrial Trucks* or *Tractors* with trailers are good for distance hauling, and serve well for traffic between buildings far apart, and in moving materials of a character not adapted to the fixed conveyor.

13. *Small Portable Power Driven Belt Conveyors* are used for feeding quantities of materials to main line conveyors.

14. *Tiering Machines* are small portable hoists with

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Insures Correct Alignment

of motor and reducer shaft

In one of the newest and most modern plants, where high production must be maintained, Jones Speed Reducers have been selected. Past performance records in other plants of this company made this a natural selection.

The view shown below illustrates an elevator drive from coal hopper to bins in a coal grinding building. Note in particular that the motor and reducer are mounted on the same cast iron base. Correct, definite alignment is assured between the motor shaft and high speed reducer shaft. There is no chance for misalignment. This assembly is recommended because it is the most convenient, the most serviceable and the most substantial.

All Jones Speed Reducers are as mechanically perfect as it is possible to make them. Their operating economy is proved over a period of many years' service. They are adopted as standard equipment by many leading manufacturers of mechanical drives. They are specified by many prominent engineers and designers.

Once installed they can almost be forgotten except for occasional replenishing of the oil supply in which the gears operate inside the dust-proof housing. Perfect lubrication, so necessary to machinery, is assured.

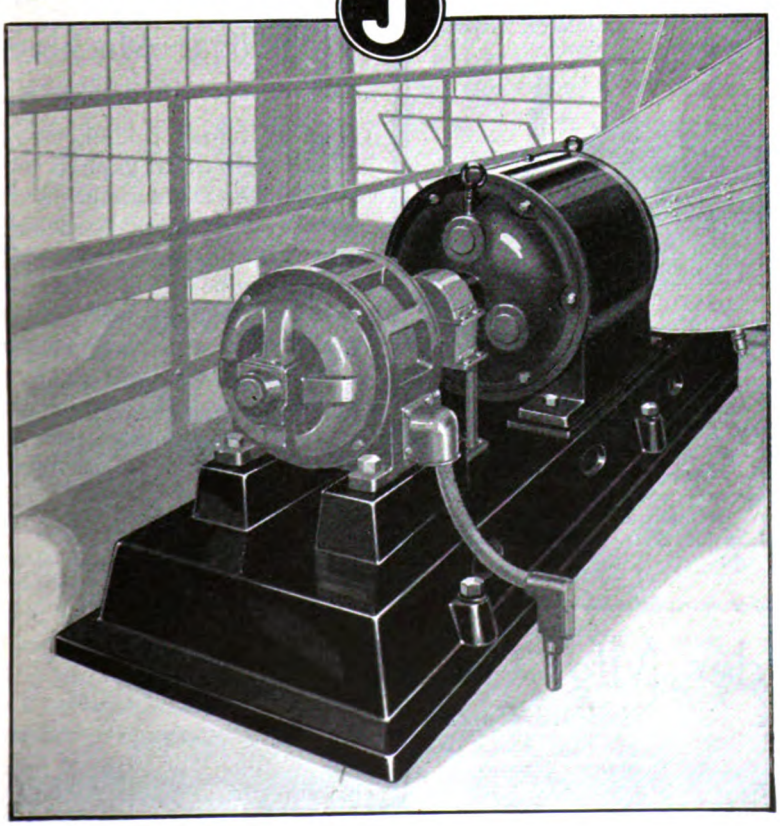
If you are interested in the application of enclosed speed reducers to your production problems, write us for catalogue Number 26.

Jones Speed Reducers

W. A. JONES FOUNDRY & MACHINE COMPANY

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When It's Self-Interest toSh ow *More* Interest

USERS of Counters have found out this: A worker does better when he can *see* how much better he's doing. Interest picks up and production goes up, when your workman can watch his score on a Counter.

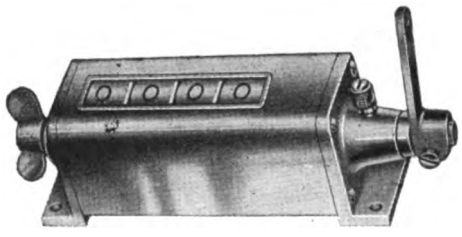
It's a matter of personal interest to the operative—*and* it's self-interest to show *more* interest when it registers directly on a

Veeder

Here's the special Veeder Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable.



Built especially for recording the product of heavy duty machinery where a reciprocating movement registers an operation. Strong stops limit the movement of the lever to 45 degrees or ⅛ turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price $18.00—list. (Cut less than 1/3 size.)



The above *Set-back Rotary Ratchet Counter* counts one for each oscillation of the lever, as required in counting the product of presses and metal-stamping machinery. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as needed. Price, with four figures as illustrated, $11.50. (subject to discount). Equipped with lock and keys to prevent tampering with the record, $2 extra. (Cut ½ size). Set-back *Revolution* Counter of similar model, price $10 (list). Smaller counters from $2.00 up.

Write for the Veeder complete-line booklet

The Veeder Mfg. Co.

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San Francisco, Cal.

extension platforms approximately 4 ft. square, with cylindrical rollers on ball bearings. These extension platforms are hoisted and lowered by electric motor and are used for piling boxes or crates on top of each other. This type of machine can be used to good advantage in buildings where there are no overhead cranes.

Before selection of the proper type of mechanical handling equipment necessary for any particular line of work, the proposition should be studied in all detail and equipment selected that will be as nearly automatic as possible. They should transport materials in such a manner as to insure an uninterrupted and steady flow of materials, and in a manner that will eliminate handling or lifting of materials by hand.

In laying out a modern manufacturing plant, every element of handling material should be carefully considered. The shipment of material into the factory is arranged for by truck, rail or boat, whichever offers the lowest cost of handling to the point in the factory where material is first started through the process of manufacture. From there on each process of handling should be studied to eliminate, so far as possible, all labor or attention on the part of the operators.

Materials once started through the shop, should not be put into storage at any point if it can possibly be avoided, but processes should be arranged in sequence so that material may follow from one to the other with as little personal attention as possible.

The same attention is given to the handling of small details contributing to the element of manufacture that is given to the main element itself.

The methods used for final packing and shipping are equally important with all other points in the method of manufacture and the more modern factories today arrange for the material to be delivered by power directly into the car for shipment.

National Machine Tool Builders' Exposition

MORE than fulfilling earlier predictions by its officers of an assured wide interest among machine tool builders and accessories companies, the National Machine Tool Builders' Association now announces that the entire area of the National Machine Tool Builders' Exposition to be held in Cleveland, September 19th-23rd inclusive, has been reserved, and that a waiting list of companies desiring display space has had to be made.

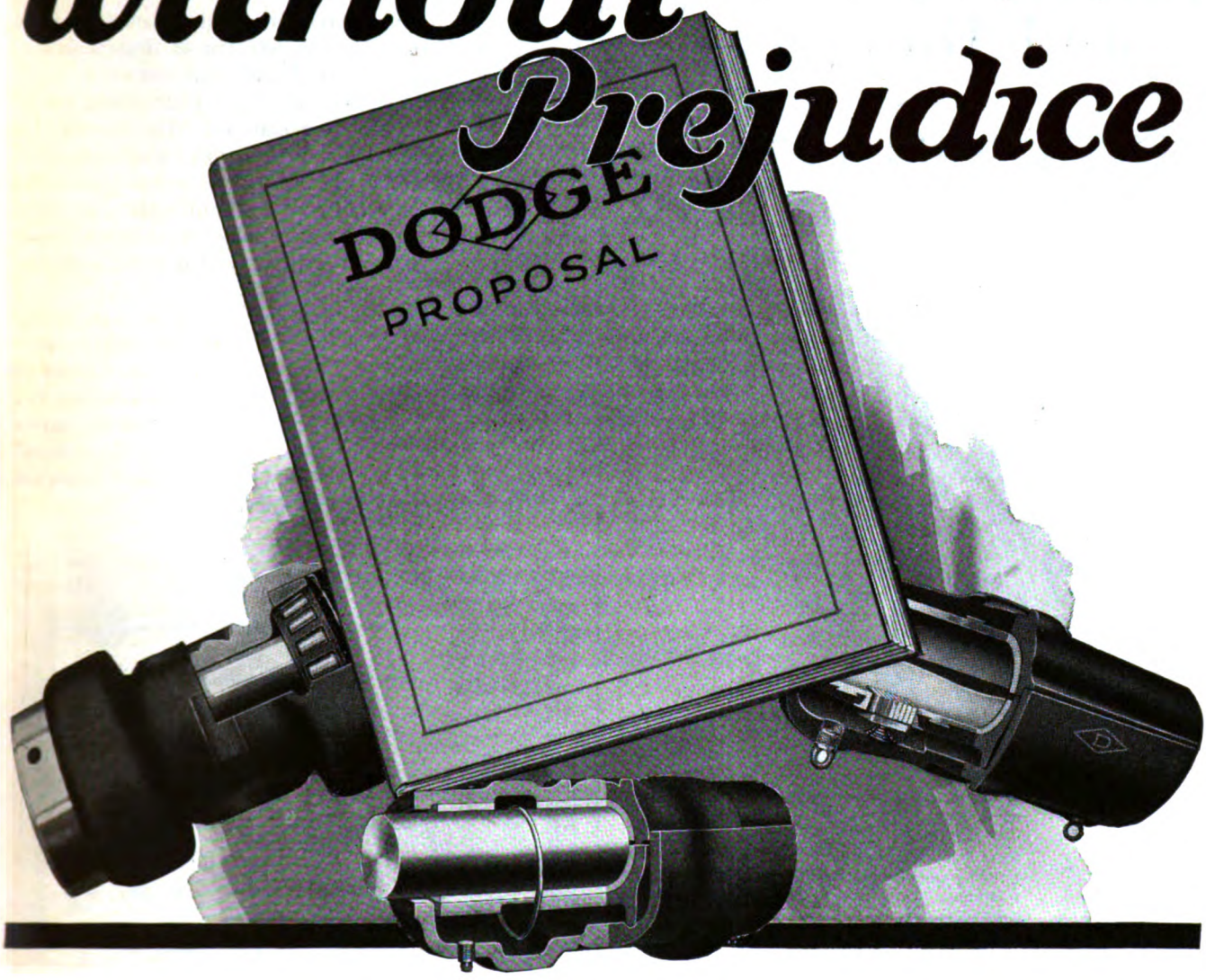
The Exposition will occupy all of the new West Annex of the $6,500,000 Public Auditorium of Cleveland. The building contains more than 100,000 square feet of floor space, practically unobstructed, and was built to meet exacting exposition specifications. Reservation of the entire area of this building, the Association announces was made before the issuance of even a tentative floor diagram to prospective exhibitors. Such a diagram, in fact, has never been issued at all.

Companies which made reservations of given amount of area early enough to be included within the building's capacity have now received from the Association's Committee on Exposition a comprehensive prospectus, covering all important physical phases of the Exposition, and including a final floor layout with exhibitors' location assigned.

advertised in this issue write Industry Illustrated

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Without Prejudice



When Dodge engineers survey your plant requirements, their object is not to prove a case for roller bearings or babbitted bearings of plain or self-oiling type; neither do they attempt to prove a case for steel, iron or wood pulleys.

Dodge alone, because of the complete line available including every type of transmitting appliance which has won a place for itself in the light of nearly a half century of experience in meeting the varied requirements of industry, can offer recommendations based upon your specific needs without prejudice.

A survey by Dodge engineers is the first step; a definite proposal is the second step. Dodge engineers are at your disposal. Their entire efforts and resources will be used to solve your power problem with maximum efficiency, economy and minimum upkeep the sole objective.

Write for our catalogue and special bulletins.

DODGE
MISHAWAKA

Booths 418, 419, 420 and 421, Chicago Power Show

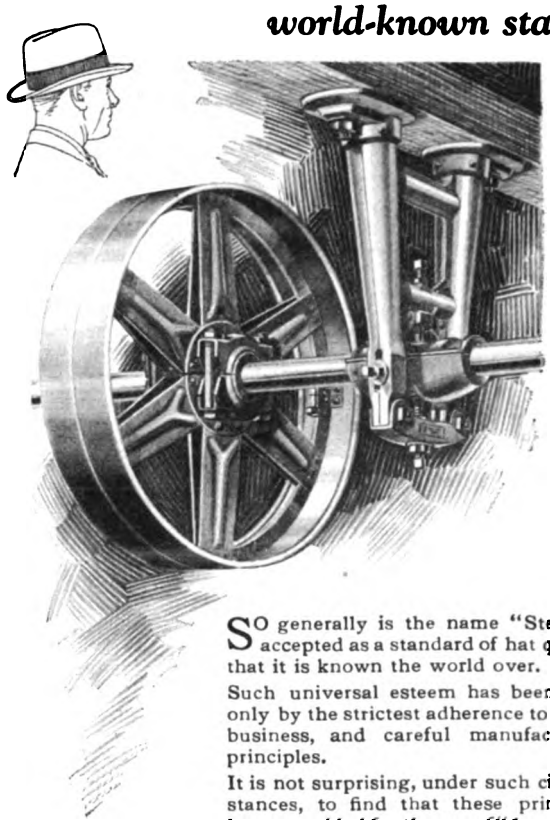
DODGE MANUFACTURING CORPORATION
MISHAWAKA, INDIANA

Power Transmission—Material Handling—Special Machinery

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"American" Pulleys and Hangers *and* STETSON HATS

—both in their own fields world-known standards



SO generally is the name "Stetson" accepted as a standard of hat quality that it is known the world over.

Such universal esteem has been won only by the strictest adherence to sound business, and careful manufacturing principles.

It is not surprising, under such circumstances, to find that these principles have provided for the use of "American" Pulleys as part of the mechanical equipment. "American" Pulleys are used in Stetson factories as they are, to the extent of millions, throughout the industrial world.

Strength with light weight (to impose no unnecessary power load); transmission efficiency (derived from true running, belt-gripping construction features, and arms that cut instead of fan the air); and ease of application (due to the design which makes it possible to install an "American" Steel Split Pulley without stripping a busy line shaft):—these are only some of the advantages which led to the adoption of "American" Pulleys as standard equipment by industrial leaders like the John B. Stetson Company.

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Avenue Philadelphia, Pa.

For nearest distributor see Mac Rae's Blue Book

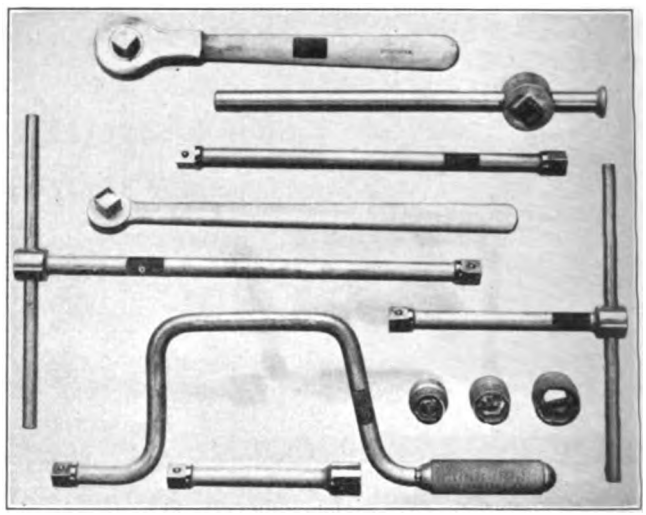
AMERICAN
PRESSED STEEL HANGERS — PATENTED
STEEL SPLIT PULLEYS — PATENTED

Chrome Vanadium Detachable Head Socket Wrenches

AMONG the new products of the Bonney Forge & Tool Works is a complete line of detachable head socket wrenches, made of chrome vanadium steel.

The sockets are forged from solid bar stock, and are not cut from bar stock or stamped from tubing. The forging process retains unbroken the grain of the steel, and this process, plus the use of chrome vanadium steel, makes these strong detachable head socket wrenches. This exceptional strength also makes it possible to manufacture these wrenches with very thin walls, a decided advantage for close corner work.

In addition to a complete line of sockets, the Bonney Forge & Tool Works have also developed a complete assortment of handles, forged from chrome vanadium steel. These consist of solid offset handles, rachet offset handles with reversible lugs, "T" handles of various lengths, sliding "T" handles, ball bearing "brace type" handles of various lengths and extension bars which can be used with any of the handles.



The one-half inch square lug, which has become practically standard for all detachable head socket wrenches is used, making it possible to use the new Bonney Socket Wrenches in connection with any detachable head socket wrenches which the mechanic may already have.

Adapters are also provided so that the Bonney chrome vanadium handles may be used for the very large sizes sockets, many of which use a five-eighths inch square.

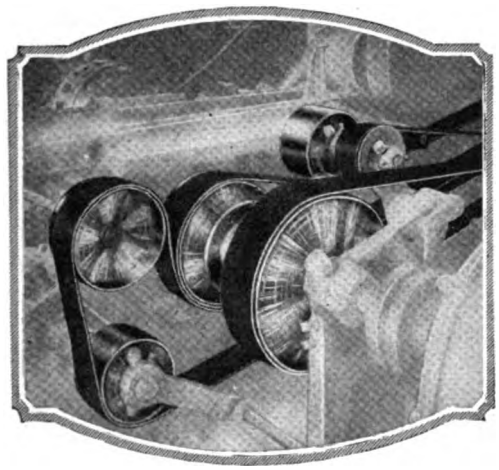
DURING the past seven years there have been depressions in the steel and petroleum industries and periods of hard times among the farmers. In the case of petroleum, improvement has come through a rapid increase in the consumption of oil products. An individual can double his use of gasoline if he has the time and money to enable him to double the use of his automobile. Similarly, the individual use of iron and steel can be increased rapidly—more automobiles, larger apartments, more oil pipe and increasing use of public utilities.

The individual consumption of wheat and corn, however, does not increase materially. When confronted with depression, the farmer does not get relief from the factor of a growing demand.—*Alexander Hamilton Institute.*

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SCHIEREN BELTS DO LAST LONGER



A more pliable belting to meet new conditions of higher line shaft speeds

Line shaft speeds are being *raised* steadily. Belts must be better than ever to meet these new service conditions.

Duxbak Belting has that extra pliability to meet the test of more speed and smaller pulleys that new conditions impose.

Free from any trace of tanning grit, its fibres are free to move without friction. You can't wear it out internally.

Ask a Schieren Salesman about this unique feature of Duxbak Belting.

Let us send you a copy of L. H. Hopkins' article, "Group Drives More Economical for Most Conditions."

DUXBAK BELTING TRADE MARK

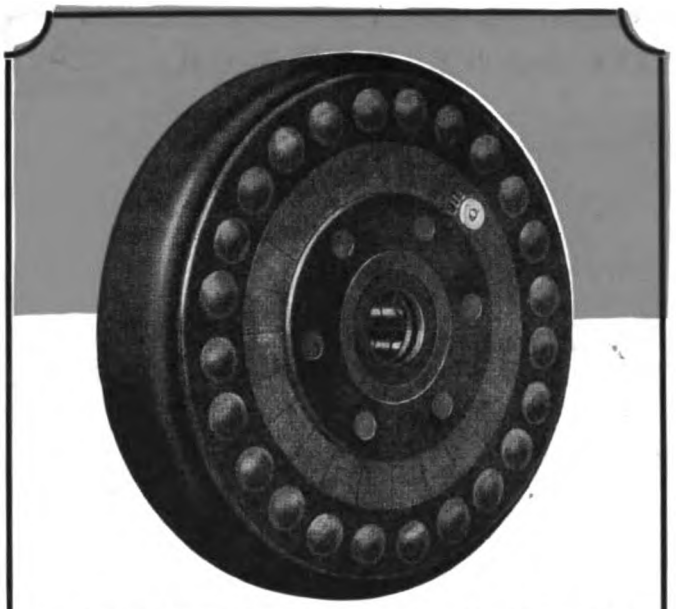
Chas. A. Schieren Company

Tanneries: Bristol, Tenn. Main Office and Factory 31 Ferry St., New York

Distributing Branches and Dealers in All Leading Cities Throughout the World

DUXBAK WATERPROOF LEATHER BELTING

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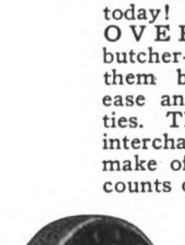


"METZGAR"

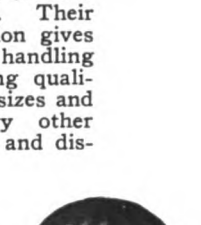
Silent Floor-Saving
END-WOOD
Truck and Caster
WHEELS
in ever-increasing demand!

"PRODUCTION!" is the cry in industry today. Factory management is ever-alert to reductions in maintenance costs.

"METZGAR END-WOOD WHEELS" are in great demand today! They cut TRUCKING OVERHEAD 50%. Their butcher-block construction gives them brute strength, handling ease and rare cushioning qualities. They come in all sizes and interchange with every other make of wheel. Prices and discounts on request.



Regular Duty
Wood Bearing



Heavy Duty
Hyatt Bearing

Metzgar Co., Inc.
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GRAND RAPIDS
MICHIGAN
U. S. A.

New Use of Air Power

AIR power, in use in a thousand ways in American industry, has been put to work as a new energizing force in modern-day railroading. It plays an important role in the operation of the oil-electric locomotive, newest power of the rails.

For twenty-five years railroads have used compressed air as a versatile ally of steam and electricity. It has been used in controlling brakes that bring speeding trains to a halt. It has operated hoists of all kinds. It has driven shop machinery. Mechanical carriers, propelled through pneumatic tubes, form a link with railway mail service.

Not until the appearance of the oil-electric locomotive, however, has the pent-up force of the air we breathe been employed in the running of a locomotive.

Compressed air, in the oil-electric locomotive, performs two distinct purposes: It starts the oil engine; it maintains an even pressure in the starting reservoirs while the locomotive is under way.

The engine of the oil-electric locomotive, of the internal combustion type, using heavy grade oil as its fuel, is started by the turn of a lever in the locomotive cab. This simple process releases air compressed at about 200 pounds pressure, from the starting reservoirs. The onrushing air sprays fuel gases into the combustion chambers of the engine's six cylinders. Instant combustion occurs and the engine starts running.

Through the operation of the compressed air system the exact pressure needed at the starting reservoirs is kept up, until the engine is turned off. In this service compressed air contributes one essential element in the economical operation of the oil-electric locomotive.

While with the automobile, using the gasoline-driven internal combustion engine, ignition is affected by means of an electric spark fired in the combustion chamber, the oil-electric requires no spark or electrical flash.

Development of the use of compressed air with the oil-electric locomotive is due to the Ingersoll-Rand Company, pioneer in the manufacture of the oil-electric locomotive.

Through the use of oil as its fuel, the oil-electric locomotive costs less to operate as a steam locomotive, while doing the same amount of work.

Oil-electric locomotives are now in practical use on nine great railroad systems throughout the country, while other railroads have ordered one or more locomotives of this new type. It is also in use in lumber, steel and other industries.

MOTOR vehicles are making inroads in the short haul traffic of the railroads, especially in the thickly settled sections of the East. But the average monthly tonnage carried by the railroads has increased 50 per cent. since 1913, and tonnage is growing faster than population.

Much of the large railroad tonnage originates in the extensive demand for oil, gasoline, steel, rubber, glass, leather, and other commodities used in the manufacture and operation of motor vehicles; and much of railroad tonnage is composed of cement, lime, brick, and stone used in building hard roads. Thus the coming of the automobile has added much to railroad tonnage, largely offsetting what it has taken away.—*La Salle Extension University.*

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Keep motors in service—

Protect man, motor and machine—save current with CUTLER-HAMMER "X" Starters

The motor that is thrown "across the line" requires better protection than the ordinary fused switch can give. For one reason, operators usually install fuses of high rating so that their machines do not stop so often.

Cutler-Hammer "X" Starters protect motor windings from dangerous overloads —yet permit heavy current draws for short durations as in starting, etc. And more—they are automatically operated. The motor is started and stopped from conveniently placed push-button stations saving time and steps.

Motors are kept in service—men, motors and machines are protected. Even the smaller motors represent an investment well worth this added protection.

The watch-dog of your motor windings

The Thermal Overload Relay on C-H "X" Starters cuts the motor from the line only at dangerous temperatures. It eliminates the delays and annoyance incident to unnecessary fuse blow-outs.

By simply changing the heater coils the same starter can be adapted to any size motor up to maximum capacity. This simplifies your stocking problem.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electric Control Apparatus
1265 St. Paul Avenue
MILWAUKEE, WISCONSIN



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Roughing It!

Hexagon Holes:—When you're short of a wrench, grind any old piece of stock to fit. Jam in the wrench without a hitch in blind positions or close work.

Accurate Threading:—Try to lose an ALLEN out of a moving part! Jerk 'em tight where they've got to *stay* and let vibration bang away.

Cold-drawn Sockets:—Give 'em all the wrench will stand. Yank 'em home; do your assembling double-quick. 30% extra strength to stand it.

For, the busiest boys will "rough it" in the best-regulated factory!

The Allen Mfg. Co.

127 Sheldon St., Hartford, Conn.

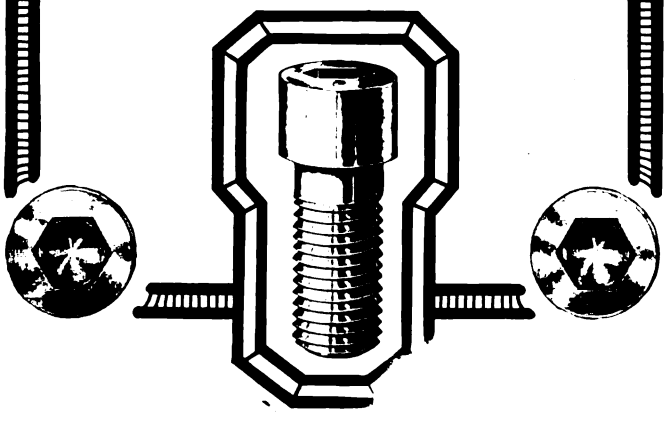
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The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the **NEW SAFETY FRICTION LOAD BRAKE** shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
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LIGHT!

where and when needed

Let us make a survey of your lighting needs—write today for booklets, or a representative's service, or both.

The economy of an American System compared with a flood light system found in the fact that the light is place exactly where needed, and it is used onl when needed.

No flood lighting of great areas with th resultant shadows on the tools just whe light is most needed—but light accurate placed which guarantees greater and bett production.

American Fixture Company
230 West Water Street **Milwaukee, Wi**

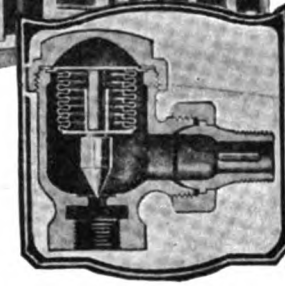
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Mack Truck Plant Uses SARCO Radiator Traps

J. F. Musselman,
Engineer



It is a convincing tribute to the performance of Sarco Radiator Traps that the International Motor Co., one of the most successful motor truck manufacturers, should install 474 Sarco Radiator Traps in the plant illustrated.

To specify "Sarco" Traps is to insure lasting satisfaction.

They are factory adjusted, noiseless, and won't freeze or air-bind. Are self-cleaning and easy to take apart. Have a high lift and unusually large discharge opening.

The helical tubing insures long life, for it has more convolutions than the disc type, therefore less stress of the metal.

Heavy wall tubing permits use up to 50 lbs.

Ask for Radiator Trap Booklet R-135, also for new Packless Inlet Valve Booklet R-153.

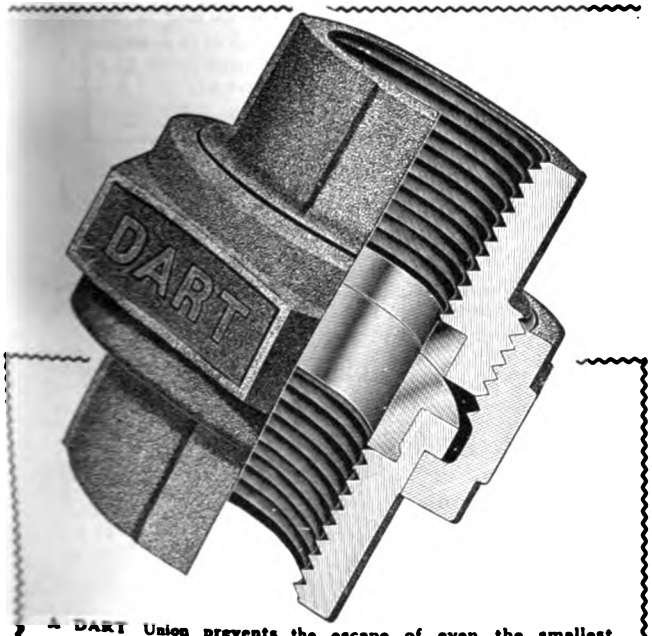
SARCO CO., INC.

183 MADISON AVENUE, NEW YORK CITY

Boston Buffalo Chicago Cleveland Detroit Philadelphia

PEACOCK BROS., LTD., MONTREAL

A DART Bronze to Bronz



A DART Union prevents the escape of even the smallest quantity of steam, thereby utilizing every ounce of power.

The Bronze-to-Bronze seat rings, machined to a true base and the joint properly ground, insures a leakless fit.

Let us tell you about DART Unions, and the Dart "Two for One" Guarantee in our new booklet.

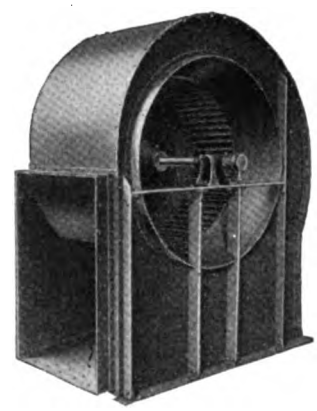
Yes, and a free sample

E. M. DART MFG. CO.

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The Fairbanks Company
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TYPE ME FAN

Tested and Certified

The ratings of the ME Fan have been definitely established in the laboratories of two universities. These ratings may be used with positive assurance.

The ME Fan uses a smaller motor with safety and lowers both initial and operating costs. It also introduces a new epoch in quiet and smooth operation.

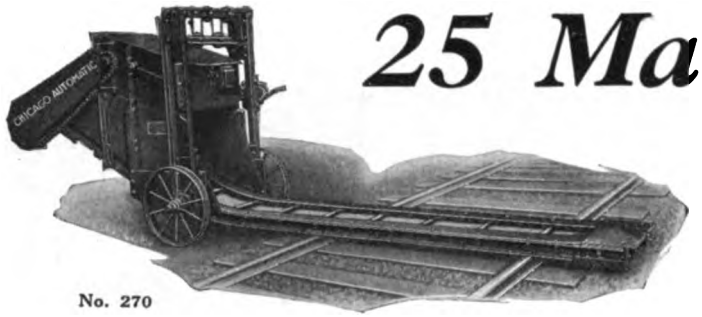
Catalog 100 tells about this remarkable fan—let us send you a copy.

Fans
Unit Heaters
Air Washers
Blowers
Furnaces

NEW YORK BLOWER COMPANY

General Offices
2244
So. Halsted
Chicago

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No. 270

25 Man Power

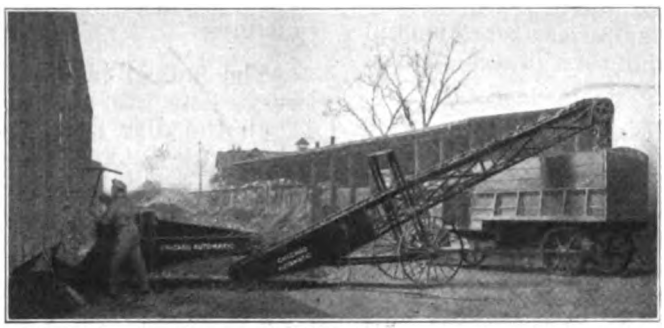
You would not put 25 men on a car of coal if you wanted it unloaded in an hour, but the

MODEL T. U. UNLOADER

will unload and clean up a car in much less time with one man, that is why you need the CHICAGO AUTOMATIC Model T. U. T. TRACKUNLOADER. NO shoveling. NO Pits. Unloads a whole car of coal in one hour. Goes under any car.

CHICAGO AUTOMATIC

The Pioneer Portable Coal Conveyor



30 minutes for unloading a car. "Handles lump, slack, hard coal and coke nicely," *says Mr. Veenstra, of the Veenstra Co., Racine, Wis.*

CHICAGO AUTOMATIC CONVEYOR CO., 982 Old Colony Bldg., Chicago, Ill.

Originators of the Portable Conveyor

BRANCH OFFICES IN ALL PRINCIPAL CITIES

EVER-HOLD TRADE MARK



AUTOMATIC ADJUSTABLE

Steel Stools for Office, Shop and General Factory Work

Patented March 16, 1926

STEEL CONSTRUCTED

Adjustable to any desired height in a moment's time without any tools. Beautiful hardwood seats.

The patented automatic adjustment is a radical departure from the old fashioned screw type or angle iron stool. It is instantaneous.



A complete line of Stools and Chairs to suit any requirement. Built for

SERVICE
COMFORT
BEAUTY
ECONOMY

ASK FOR OUR LATEST CATALOG



Eastern Distributors:
INDUSTRIAL SALES CO.
328 Main St., E. Rochester, N. Y.

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ADOLF RRESE CORPORATION
726 So. Hope St., Los Angeles, Calif.

Other Distributors Wan

VITEK MFG. CO. ( ),
U. S

CATALOG 22

Illustrates in actual size and shows sectional drawings with the detailed dimensions of

275 STYLES AND SIZES

GITS BROS.

Better Oilers

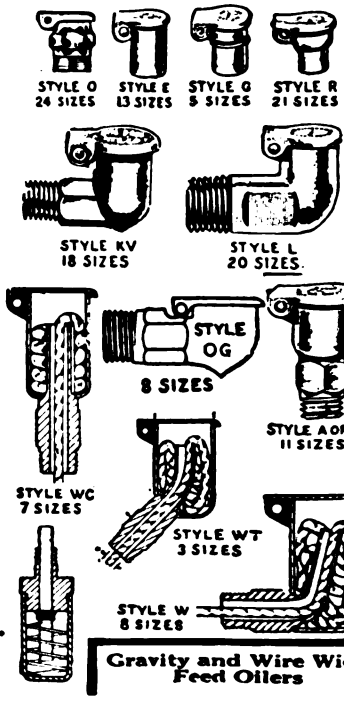
For Every Lubricating Requirement

Oil Cups

Oil Hole Covers

Wire Wick Oilers

Auto Chassis Lubricators



GITS BROS. MFG. CO.
1940 S. Kilbourn
CHICAGO

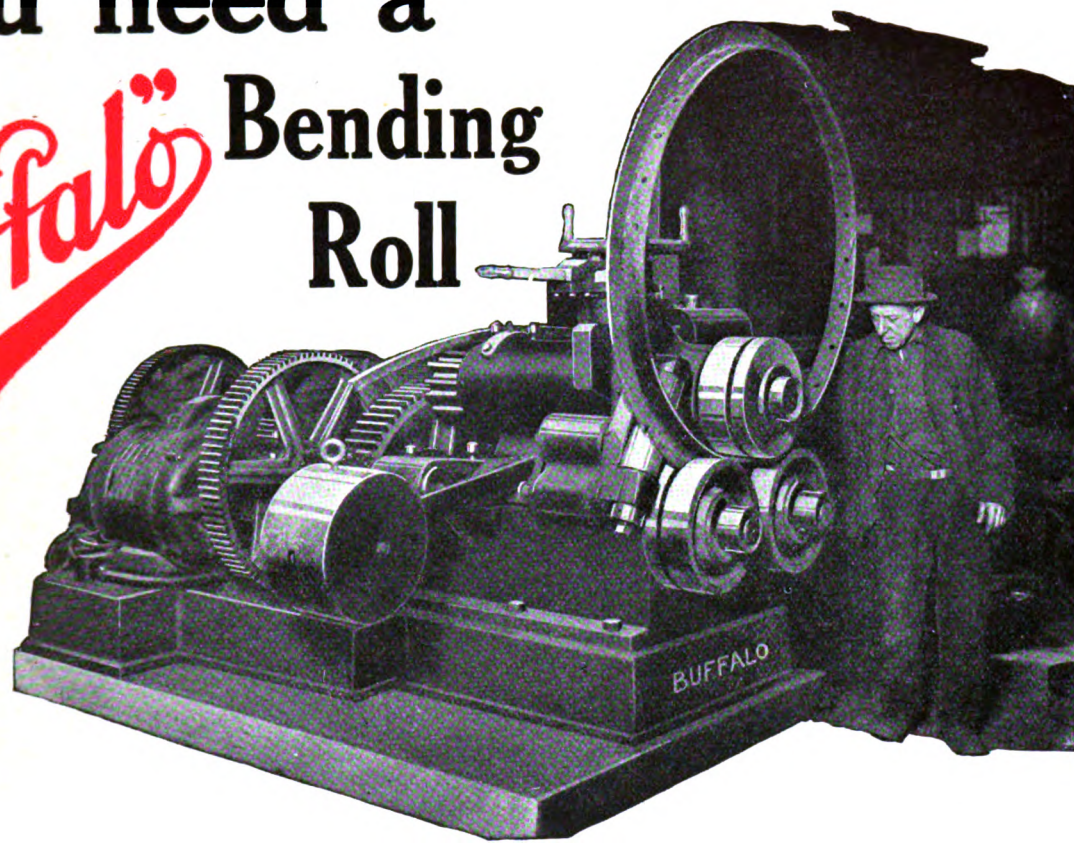
Gravity and Wire Wick Feed Oilers

write Industry Illustrated

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Do you *bend* metal?

—you need a "Buffalo" Bending Roll

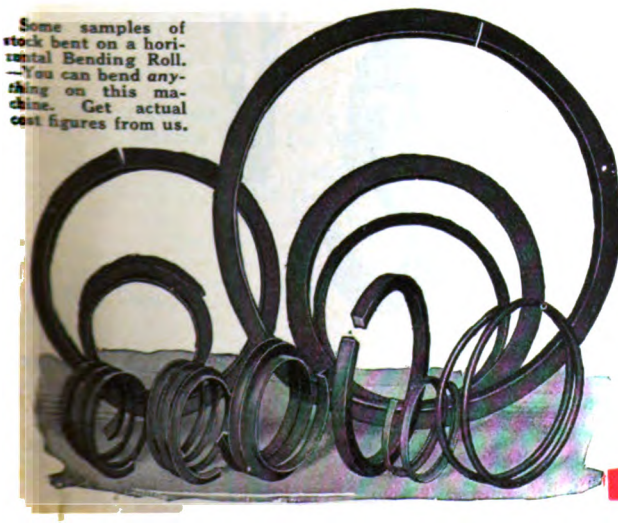


This shows the vertical Bending Roll, hundreds of which are in use—saving thousands of dollars every day.

We also make a horizontal type roll—ask for bulletins describing both.

If you bend angles, flats, tees, squares, rounds, copper tubes, steel pipe, channels, I-beams or special shapes—you can bend them more accurately on a Buffalo Bending Roll. Each bend will be handled quicker and easier, and the cost of bends will drop to an almost unbelievable figure.

Users tell us that the machine pays for itself in less than a year and it enables them to handle two or three times as much work.



Some samples of stock bent on a horizontal Bending Roll. —You can bend *anything* on this machine. Get actual cost figures from us.

If you will let us tell you how little it costs to bend stock on a Buffalo Bending Roll—you can decide easily whether or not this machine belongs in your shop.

Ask for Bulletin 317-B.

WRITE OR WIRE FOR PRICES

Buffalo Forge Company

440-486 Broadway, Buffalo, N. Y.

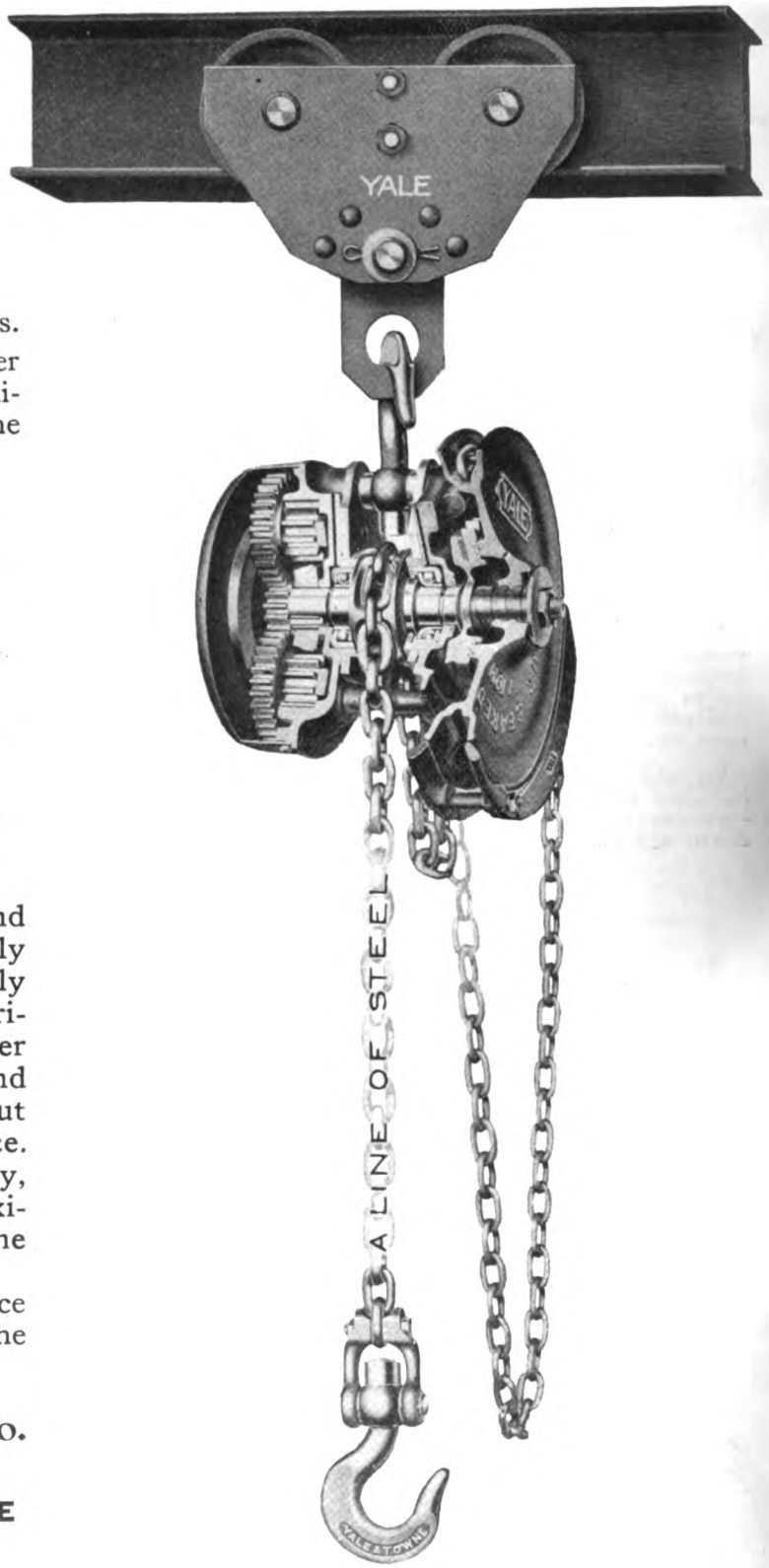
In Canada — Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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Ask these Questions

when investigating Chain Block Facts

TRADE **YALE** MARK



Everybody wants to get at the truth about hoisting equipment.

Yale welcomes inquiries and invites tests to determine the facts.

Consult any experienced engineer or purchasing agent who has investigated the Chain Block field and he will tell you to find out whether

—The chain block is ball-bearing on ***the load sheave***

—The steel load chain is die formed, side-welded, ***heat-treated and gauged***

—The suspension plates are ***heavy wrought steel***

—The chilled tread trolley wheels are supported on eight steel ***roller bearings***

—The steel equalizing pin allows for adjustment in width of I beam and permits flexibility

The Yale Ball-Bearing Block and Roller-Bearing Trolley is the only combination which satisfactorily embodies all these points of superiority. It has numerous other points—if you have the time and inclination to look for them—but you can tell those listed at a glance. Combined with maximum safety, what you want most of all is maximum reduction in friction—and the Yale Chain Block has it.

May we send for your reference files our two folders which state the Yale facts fully and concisely?

The Yale & Towne Mfg. Co.
Stamford, Conn., U. S. A.

YALE MARKED IS YALE MADE

Canadian Branch
at
St. Catharines, Ont.

YALE **Hoisting and Conveying Systems**

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Protected by a HORTON TANK

these buildings still stand

while 50 feet away a plant lies in ruins



40,000 gallon hemispherical - bottom tank, 90 feet to bottom supplying sprinkler system at the plant of the Hunter Arms Company, Fulton, New York.



Ruins of two-story wooden factory building across the alley from the Hunter Arms plant. It had no fire protection system. When the Public Fire Department arrived, the blaze had so great a start it could not be stopped.

THESE two plants stood side by side, separated only by an alley. The one in ruins had no fire protection system. The one still standing—the Hunter Arms Company, Fulton, New York—had a Horton Tank and a sprinkler system.

Adequate fire protection is worth more than the saving in property values. **It prevents costly delays to operation, the breaking up of a carefully developed organization and, in some cases, the forced suspension of the business.**

See that a Horton Tank protects your property. When the emergency comes, the water supply is certain. Gravity cannot fail. Let us quote you on a tank to meet your requirements for fire protection, general service, or both.

Write our nearest sales office for a quotation or a copy of "Horton Tanks for Fire Protection."

Chicago	2465 Old Colony Bldg.
New York	3169 Hudson Terminal Bldg.
Cleveland	2238 Union Trust Bldg.
Dallas	1658 Praetorian Bldg.
Atlanta	1023 Healey Bldg.
San Francisco	1043 Rialto Bldg.
Havana, Cuba	Apartado 2507

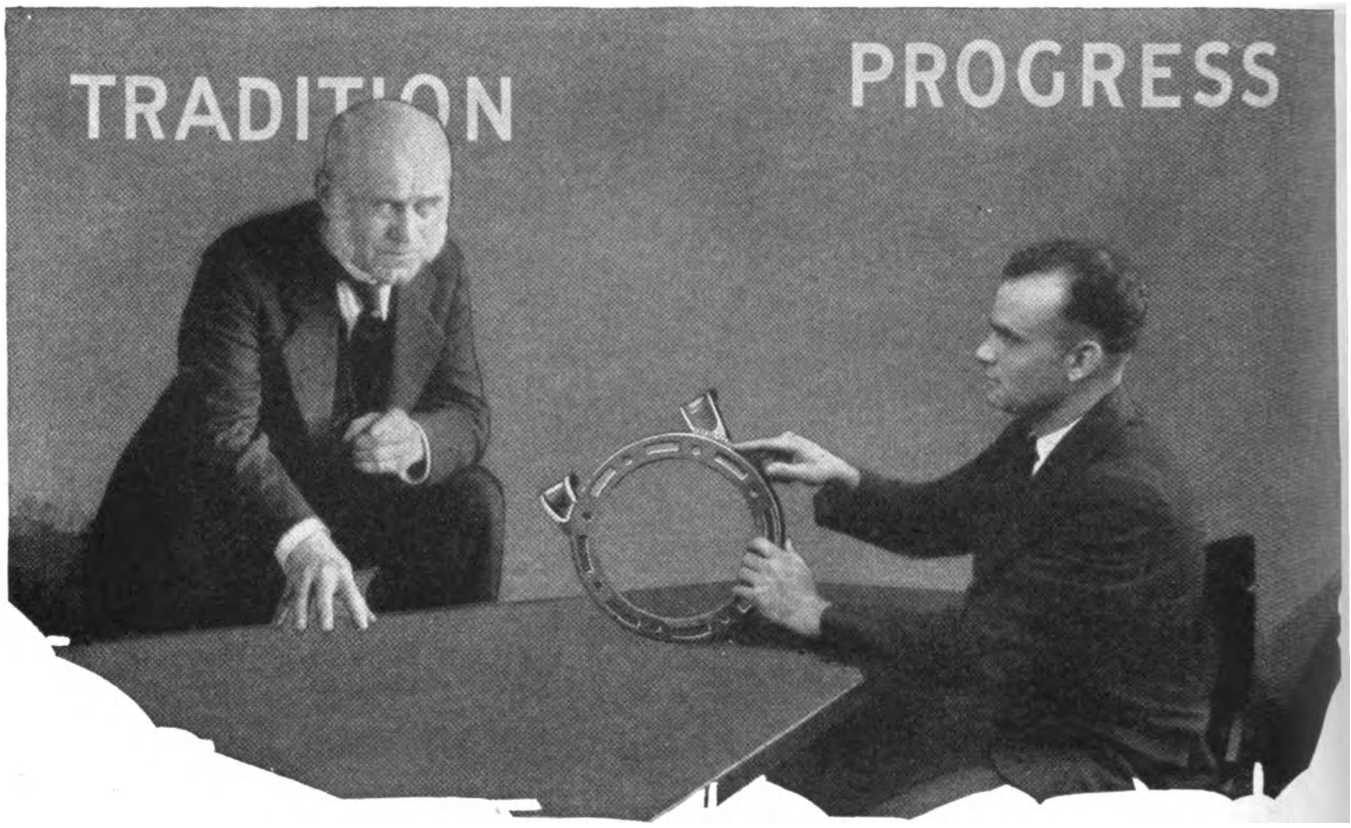
CHICAGO BRIDGE & IRON WORKS

HORTON TANKS

11-2-Gray

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Pop Decides Not to Fire the Sweeper



"Here, Lad—

fire that sweeper in the lower plant—he's too careless! Last night he ran his rubbish truck against a motor and broke a foot off it—so we lose that machine's production until they get a new motor on the job."

"No, Pop—

you can't buy common sense in a sweeper, but you'd at least *expect* it in a motor maker.

There's always something sideswiping motors—and yet your gang of stiff-back motor assemblers stick to cast-iron feet. If they themselves didn't have clay feet they would weld drop-forged feet to a steel frame—just as in the Linc-Weld Motor.

Then your sweeper could do calisthenics with a sixteen-pound sledge and he couldn't 'drop' a motor."

See Page 7 of the Motor Book. Better get yourself a copy from—

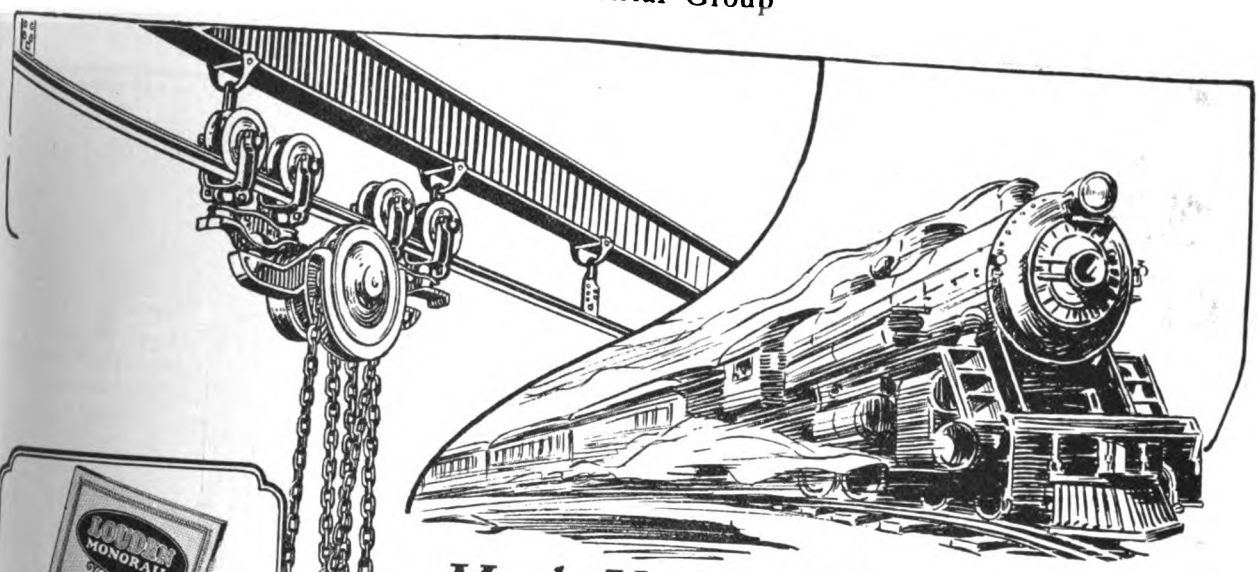
The Lincoln Electric Company, Dept. No. 17-2, Cleveland Ohio

MA-2

"Linc-Weld"

LINCOLN MOTOR

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Maybe You Have Never Even Heard of the Greatest Rail System in America

It issues no time tables, this great rail system. It carries no passengers. It has no capital stock and no bonded indebtedness. Yet it pays enormous dividends with never-failing regularity. It moves a mountain of material and merchandise every day with ease and dispatch. Its roadbed cost nothing to build.

It is the Louden Monorail System! During the past ten years thousands of miles of Louden Monorail have been laid on that last great trackless waste of America — the ceilings of industrial plants. From plant unit to plant unit, from machine to machine, this overhead monorail has been the track along which the raw material has moved *faster* to become a finished product.

Have you a material handling problem? Then you should investigate the possibilities of the Louden Monorail System in your business. No plant is too small, none too large, to profit by the installation of this system. It can be adapted perfectly to every handling problem — no matter what the shape or weight of the unit, up to 2000 lbs. It will speed up production. It eliminates back-breaking work for employes. It relieves congestion on the floor. It reduces breakage to a minimum. It lessens labor turnover.

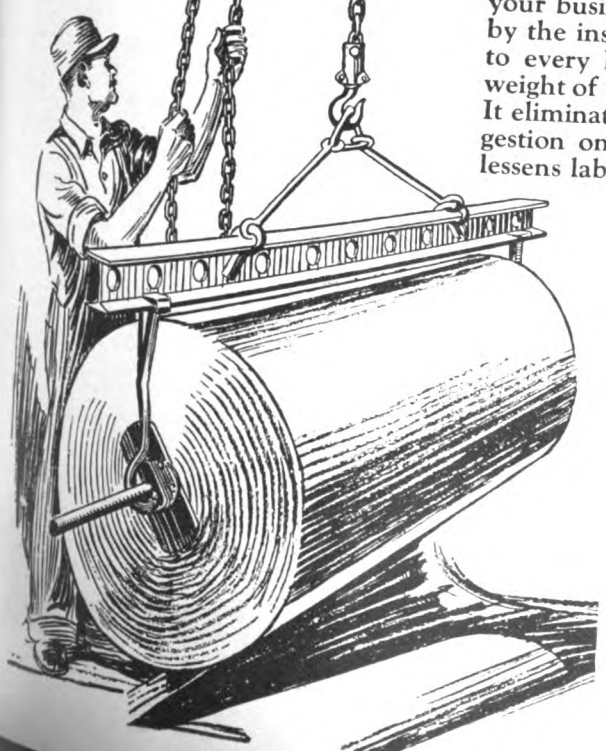


Get This Material Handling Book

Just off the press. Tells a remarkable story of conveying materials in process of manufacture, storing goods, handling finished products, etc.

56 pages of dimensional drawings alone, 72 pages showing applications of Louden Monorail to scores of different types and kinds of work. Information on track, trolleys, switches, dipping machines, monorail scales, cranes, track hoists, etc.

Data showing how to lower production costs. Let us send you a copy of this valuable new Material Handling book. No cost or obligation of course.



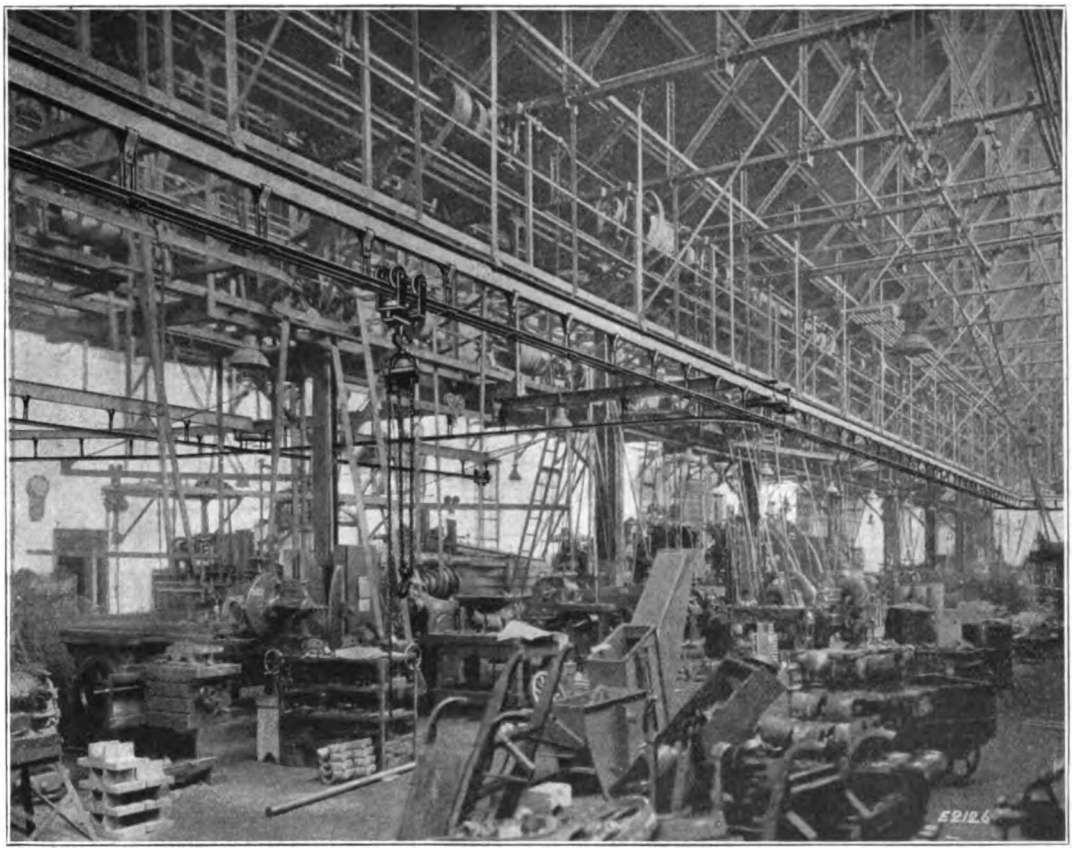
Let the Louden Monorail Man Give You Material Handling Facts

He is an expert in material handling problems and the planning and installation of overhead carrying systems. He will give you sound advice on what such a system can do for you. He is close at hand and there's no obligation attached. Don't think your problem is too small. Louden likes to serve the one-man shop or warehouse as well as the plant that covers many acres.

The LOUDEN MACHINERY COMPANY
[Established 1867]
600 West Avenue, Fairfield, Iowa
Canadian Factory, Guelph, Ont. *Branches in Principal Cities*

LOUDEN
INDUSTRIAL MONORAIL SYSTEMS
for Overhead Lifting and Carrying

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The DUO-RAIL System in the machine shop of a large conveyor manufacturing plant.

The Highest Endorsement

A Handling Equipment Manufacturer Employs the "ATLAS" Duo-Rail System

You will find the ATLAS DUO-RAIL System installed in one of the oldest and largest conveyor equipment manufacturing plants in the country.

They chose the DUO-RAIL System above all others, and it has replaced the old I-Beam System, which operated roughly, jerky and far from satisfactorily under heavy loads. The DUO-RAIL, with its railroad principle of two rails, eliminates all sharp impacts, sudden jar and vibrations just as in railroad transportation.

In the DUO-RAIL, the rails are staggered, which gives longer life and safer, steadier, more efficient transportation of parts and products, in process and in the finished state, from one end of the plant to the other.

The DUO-RAIL handles glass, wet enamel ware, pottery, cement forms, foundry flasks, molten metal and other hard-to-handle products with facility and dispatch.

Let us show you what the ATLAS DUO-RAIL System will do for you. No obligation.

Write for the New Book



"The ATLAS of Mechanical Conveying." It is free.

The ATLAS-CHICAGO COMPANY

Division of Chicago Electric Company

740-744 West Van Buren Street, Chicago, Illinois



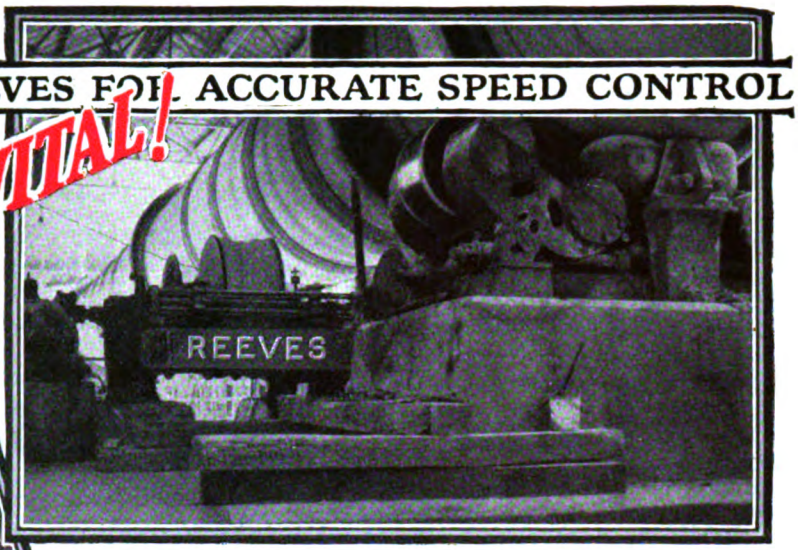
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INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

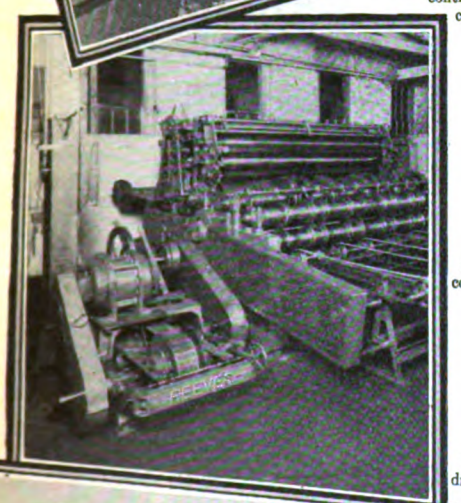
Speed Flexibility is VITAL!



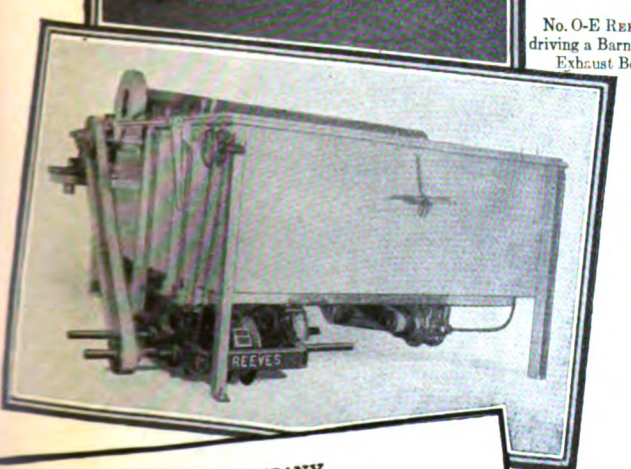
The REEVES driving a continuous paint conveyor



No. 9-D REEVES Transmission driving a lime kiln.



A REEVES-driven corrugated printing press



No. O-E REEVES driving a Barngrover Exhaust Box

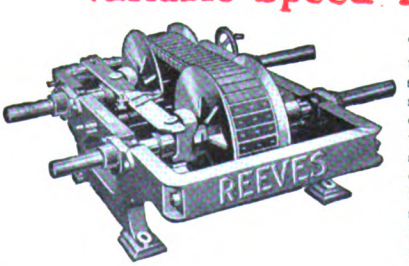
What Is YOUR Problem in Speed Control?

IN EVERY INDUSTRY there are certain machines or conveyors that *must be* flexible—able to run at *any* speed between fastest and slowest. Modern production and material handling methods make speed flexibility absolutely VITAL!

What is the speed control problem in YOUR plant? Are there machines that handle different classes of materials and must operate at a different speed for each class? Or, have you a special process that requires frequent and accurate changes in the operating time? Whatever your problem, our engineers are trained to solve it. The REEVES Transmission, either automatic or hand-operated, will give you the most accurate, the most economical, and the most dependable method of speed control. Put your problems up to us. Write for all the facts.

REEVES

Variable Speed Transmission



The REEVES Transmission represents the *only* method which gives you absolute and complete control over the speed of your machines and conveyors. It is a simple, inexpensive device which receives power at a constant speed and delivers it at *any* speed desired. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. Accurate and dependable, always.

REEVES PULLEY COMPANY
Columbus, Indiana

- ☐ Send me detailed information about the REEVES in the.....industry.
- ☐ Send me your new catalog G-66, the authority on speed flexibility.
- ☐ Tell me the economical advantages of the REEVES over a variable speed motor.

Name_____

Address_____

City_____

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"The Sample Increased Production, We'll Equip the Whole Plant"

THIS is, in substance, the verdict of Blood Brothers Machine Company of Allegan, Mich. Improved lighting was installed in the inspection and assembly departments. The company contemplates bringing up the standard of lighting in all departments to obtain more comfortable working conditions and lower production costs. The same satisfaction was experienced by over 15,000 factories which brought their lighting up to standard last year. They did it at the recommendation of their local electric light companies



Before—The camera shows heavy shadows not noticeable to the eye

After—Shadows are eliminated in this photo which accounts for increased production

In Michigan, 276 factories installed improved lighting last year. In the Blood Brothers plant, the Consumers Power Company made a complete layout for the new lighting. The part that was installed first proved so successful that the entire system will shortly be installed.

Industrial Lighting Fact No. 4

You, too, can increase your production by bringing your lighting up to the proper standard. Without cost your local electric light company will gladly show you how.

Industrial Lighting Committee, National Electric Light Associa
29 West 39th St., New York

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Willys-Overland Expands—with Fenestra

In their most recent plant expansion, the Willys-Overland Company incorporated over 100,000 square feet of Fenestra steel windows in new buildings and additions.

Willys-Overland's choice is the choice of the automobile industry, for 36 other nationally known manufacturers of automobiles and accessories operate in plants daylighted by Fenestra WindoWalls.

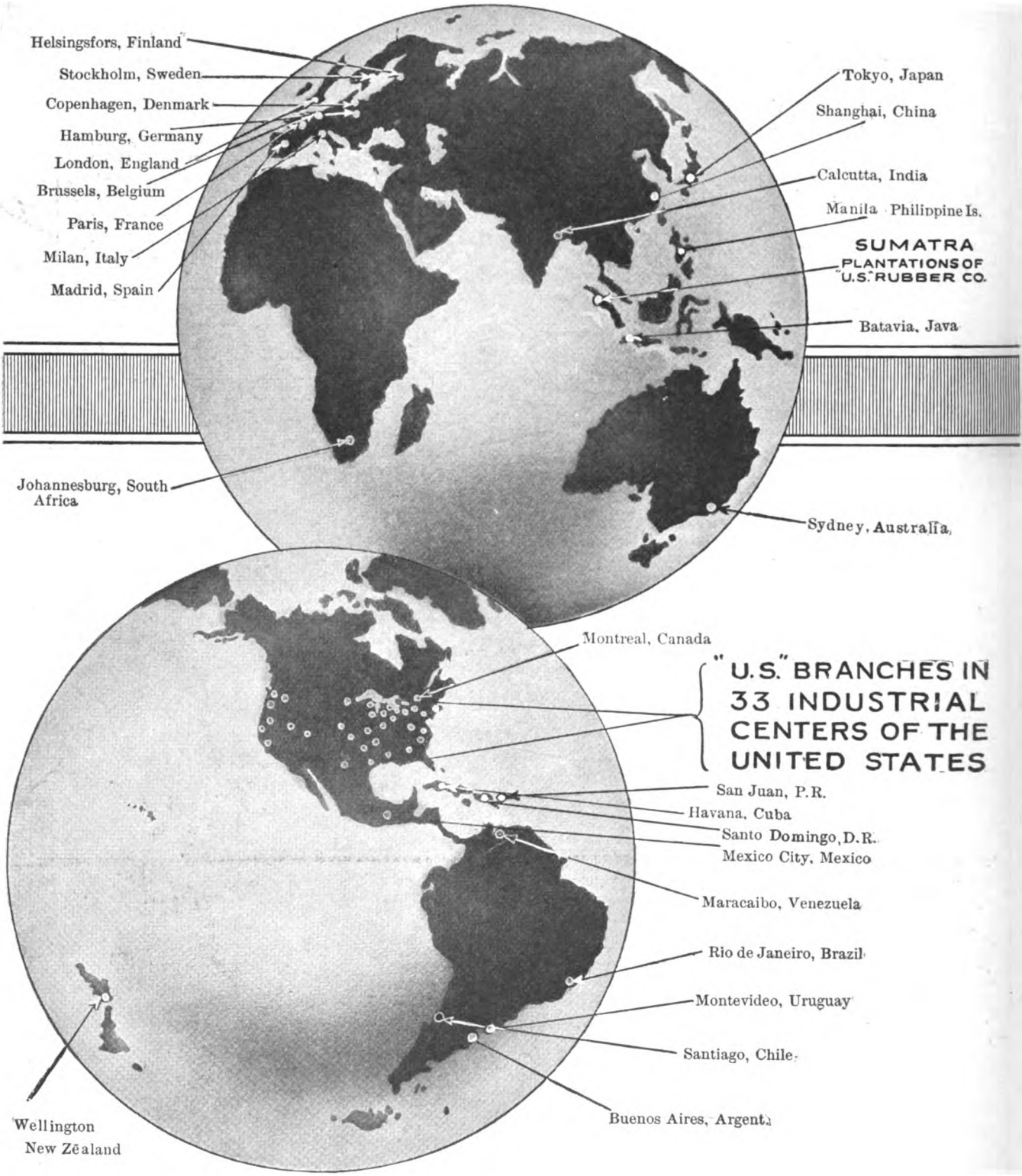
DETROIT STEEL PRODUCTS CO.
T-2278 East Grand Blvd., Detroit, Mich.
Factories: Detroit, Mich., Oakland, Calif., and Toronto, Ontario, Canada

Fenestra
WINDOWALLS

DESIGNED BY THE COMPANY'S ENGINEERS CONTRACTORS: HENRY J. SPIEKER CO.

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"U.S." Service Covers



"U.S." Mechanical

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the World—

Mechanical Rubber Goods for Every Industrial Need

ALL over the world—in South African Gold Mines—in the nitrate fields of Chile — on construction work in New York City —in the oil fields of Texas and Oklahoma—wherever the wheels of industry move, the "U. S." Trade Mark, quality stamp of the United States Rubber Company, is recognized as a guarantee of greater service and dependability on Mechanical Rubber Goods.

The "U. S." Line is the perfected result of over 75 years' experience in the manufacture of Mechanical Rubber Goods for industrial service. Miles of "U. S." Conveyor Belting are carrying materials in every part of the world — thousands of pulley wheels are driven by "U. S." Transmission Belting— "U. S." Packings are known for their unfailing service in engine rooms from Bombay to Barcelona. Oil hose, water hose, steam hose—there's a special type of "U. S." Hose for every service.

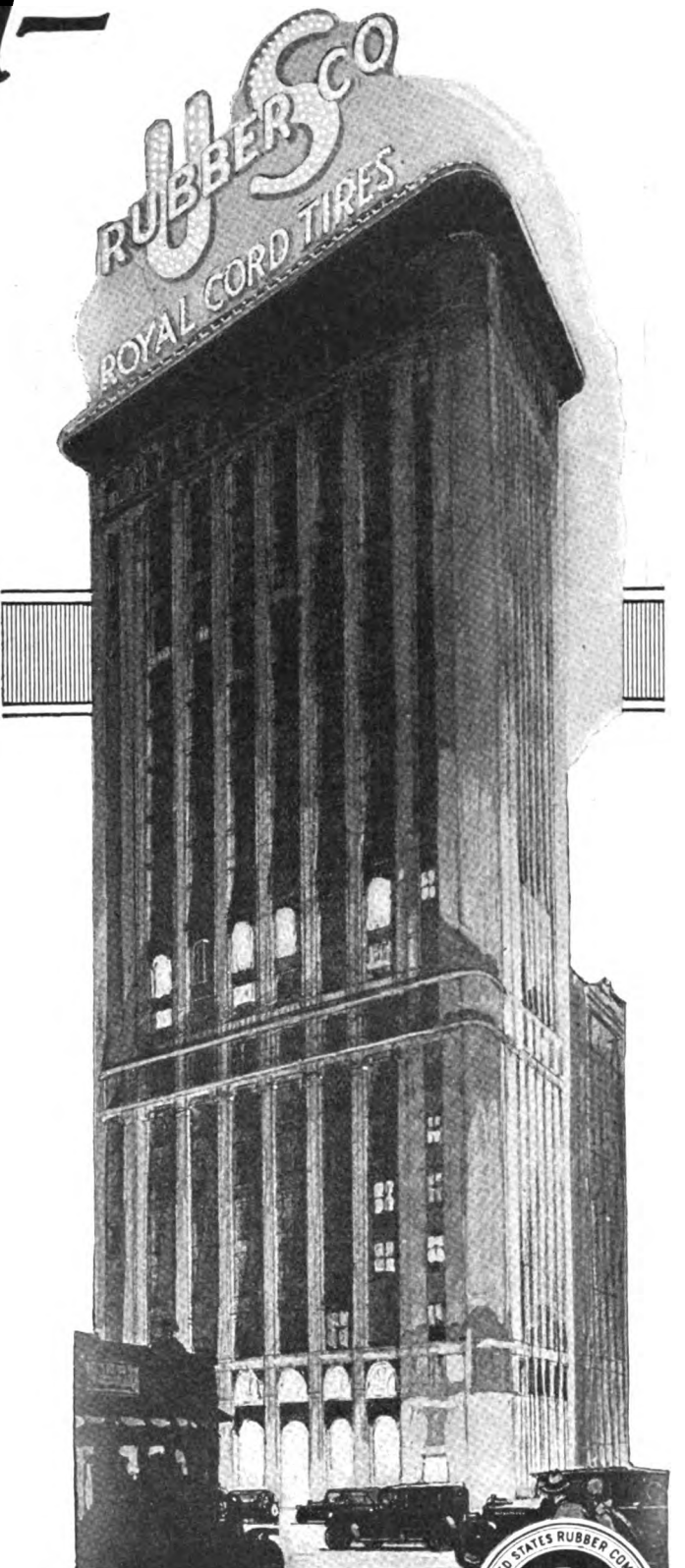
If it's made of rubber you can get it from a "U. S." Branch.

"U. S." Sales Engineers in every part of the world are ready to serve you. Make use of their experience and advice when you buy Mechanical Rubber Goods.

United States Rubber Company

1790 Broadway New York City

Branches in every industrial center



United States Rubber Company Building, New York City, headquarters of the world's largest grower, manufacturer and distributor of rubber and its products.

UNITED STATES RUBBER COMPANY
US
RUBBER SYSTEM
AND ASSOCIATED COMPANIES

Trade Mark

Rubber Goods

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WILLIAMSPORT WIRE ROPE

Telfax Tape marked
Factory certified

is standard equipment on

KEYSTONE DRILLERS and EXCAVATORS

This message is broadcast to 1,368,000 people using wire rope because it deserves to be.

You men who risk your lives with ponderous machinery are entitled to the protection you get in the use of Williamsport Wire Rope and a manufacturer who thus equips his machinery is thinking more of your safety than the price he pays. He believes in safeguarding you in every way available and Williamsport is the only wire rope made, all grades of which are marked with plain English proof. Such manufacturers deserve your confidence. You have a right to be nervous about the tensile strength of ropes not so marked. The good name of any manufacturer is not a protection against mistakes—but the wrong grade of Williamsport Wire Ropes can be instantly detected by anyone. Others can not.

Isn't this protection worth demanding? If you think so, insist upon Williamsport equipment on the machines you use, for your own protection.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
Williamsport, Penn.

General Sales Office
Peoples Gas Building, Chicago

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PROTECTION!

Losing an Order *and* Gaining a Friend

Now and then we lose an installation of circuit breakers through any one of half a dozen reasons: price, reciprocity, mistaken sales strategy, tactlessness or perhaps through feeling a bit too sure. These losses hurt for the moment, but we invariably find that losing an order often makes a lifelong friend and customer. Moral victories —yes, to be sure—but they don't help meet the payroll of either party.

Usually it happens that when the buyer of "electrical protection" investigates thoroughly the merits of the equipment—not only initial cost but right on down to final economy—he invariably specifies I-T-E Breakers—and sees to it that they are installed.

THE CUTTER COMPANY
ESTABLISHED 1888—PHILADELPHIA
1924 HAMILTON STREET



Two 5,000 ampere, 600 volt, I-T-E type "LG," 3 pole solenoid operated Circuit Breakers installed at the new Gould Street station of the Consolidated Gas, Electric Light and Power Company of Baltimore.

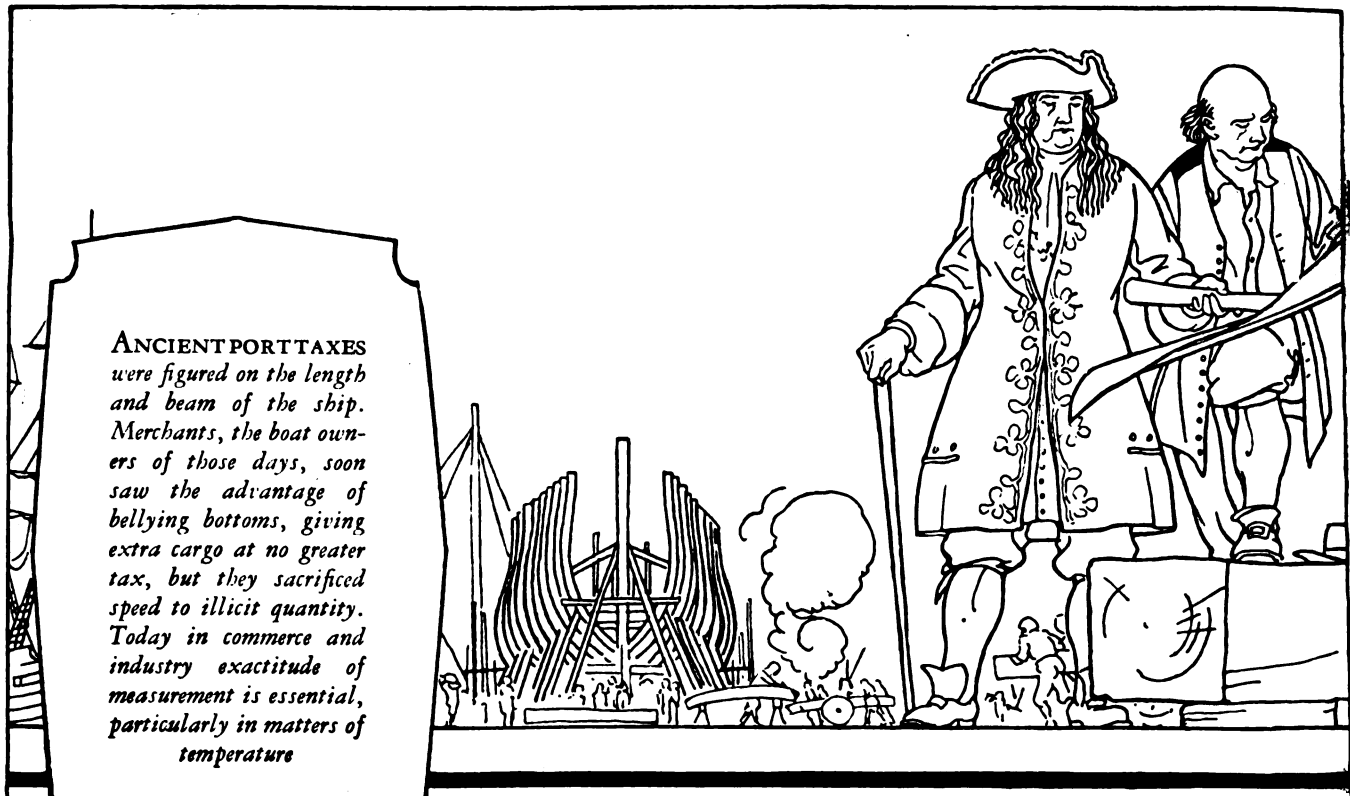
Among the interesting features of these big Alternating Current Air Circuit Breakers is the fact that they are electrically trip free at any point of the closing stroke.

This new development is in line with Cutter's policy of continual improvement in design and construction.

CUTTER

U-RE-LITE • • • I-T-E CIRCUIT BREAKERS

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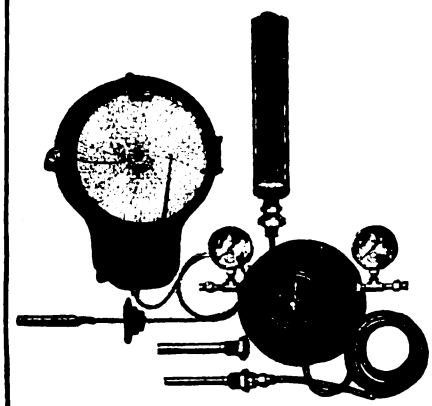


ANCIENT PORT TAXES *were figured on the length and beam of the ship. Merchants, the boat owners of those days, soon saw the advantage of bellying bottoms, giving extra cargo at no greater tax, but they sacrificed speed to illicit quantity. Today in commerce and industry exactitude of measurement is essential, particularly in matters of temperature*

In selling instruments of measurement the obligation is ACCURACY

If you knew exactly which instruments you sold were to be arbiters of life or death—you could sell to those buyers your best, and carry less accurate instruments for others. But you never know when any particular instrument of measurement may become an instrument of destiny.

The instrument you sell today may decide the fate of your community's most valuable citizen tomorrow. On the seller, on the maker of such instruments rests a heavy responsibility. In industry at its critical points; in the sick room while life hangs in the balance; on land, on sea, in the air when accuracy may mean life or death—*Tycos* instruments are meeting their obligations faithfully. The Taylor Instrument Companies make over eight thousand styles of *Tycos* Instruments used in the home, the hospital, the laboratory, in industry, on land and sea and in the air. They answer questions of temperature—accurately.



Taylor Instrument Companies

ROCHESTER, N. Y., U. S. A.

CANADIAN PLANT
TYCOS BUILDING, TORONTO

MANUFACTURING DISTRIBUTORS IN GREAT BRITAIN, SHORT & MASON, LTD., LONDON

REG. U.S. PAT. OFF. *Tycos* ROCHESTER, N.Y.

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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You can *trust your life* to the "SUPERRENCH"



This workers knows what the "SUPERRENCH" will stand. Every day at dizzy heights he strains his muscles on the **"Superrench"** to bring bolt holes in line or draw up a nut. A broken wrench would mean a fall and death, but he doesn't worry. He knows the super strength of Chrome-Molybdenum "Superrenches."

For every tough job that you have there is a **"Superrench"** to make it easier, and do it quicker and better. They are lighter and trimmer than carbon steel wrenches, yet far stronger. Every one is guaranteed to strip the thread of a standard nut or break the bolt before spreading the jaws. If you use wrenches, it will pay you to investigate the **"Superrench."** Write for literature.



J. H. WILLIAMS & CO.

"The Wrench People"

New York BUFFALO Chicago

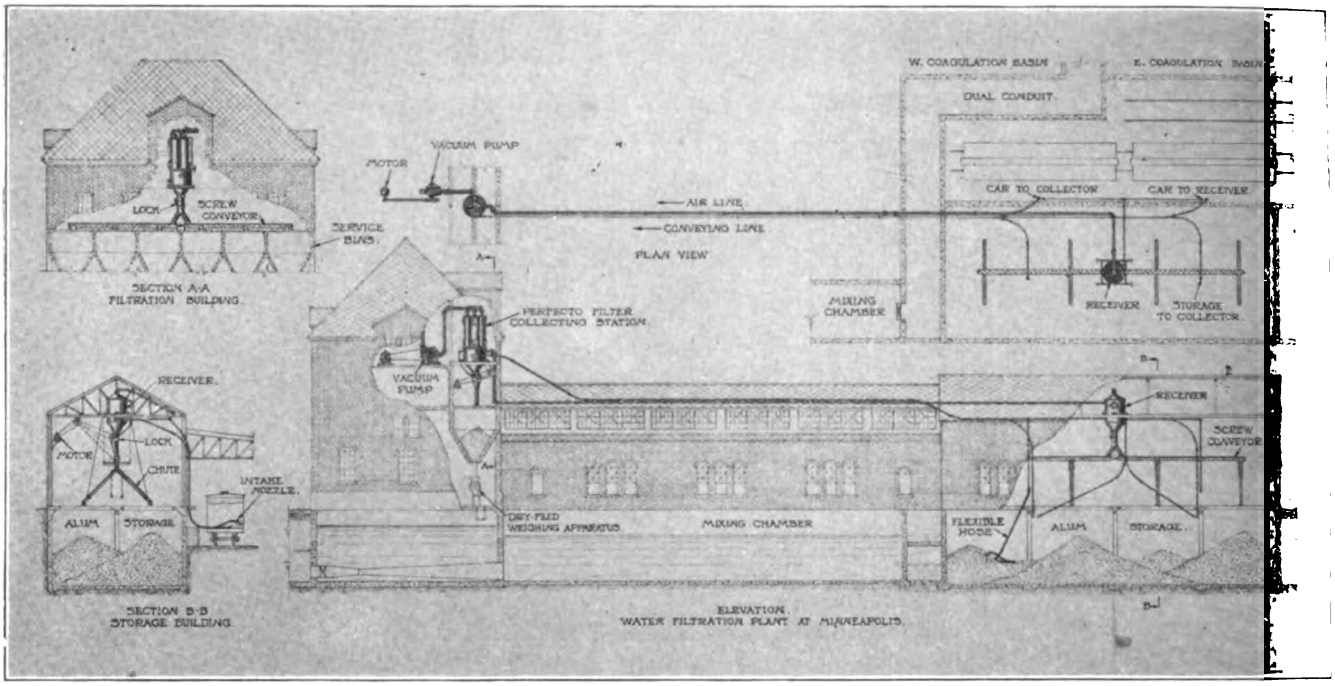
WILLIAMS

SUPERIOR DROP-FORGED TOOLS

"SUPERRENCH"

(Chrome-Molybdenum)

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Another "DRACCO" *Installation*

a Pneumatic Alum Conveyor for Water Filtration Plant

If you transport, handle or convey dry materials, such as Soda Ash, Lime, Antimony, Oxide, Lithopone, Fuller's Earth, Sand, Sodium Bisulphate, Talc Powder, Crushed Bone, Fertilizer and other similar dusty, injurious materials, then you will be interested in this installation.

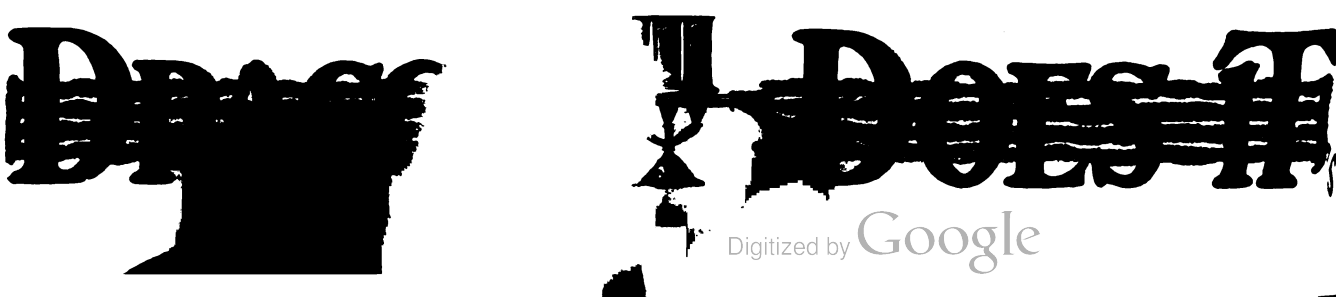
The City of Minneapolis now transports eight tons of Alum per hour from cars and primary storage to service hoppers. Since it installed a DRACCO Conveying System at the Fridley water filtration plant, the dust is filtered from the air so that not over 2½% of the dust will pass from the receiver to the collector and filter.

A DRACCO Dust Recovering and Conveying System will reduce your labor turnover, cut down fire and health hazards, save valuable materials, and above all, give you clean, healthful work rooms. Our engineers are ready to go over your requirements and suggest the DRACCO System most applicable to your conditions.

Write for Bulletin 515 which describes this installation.

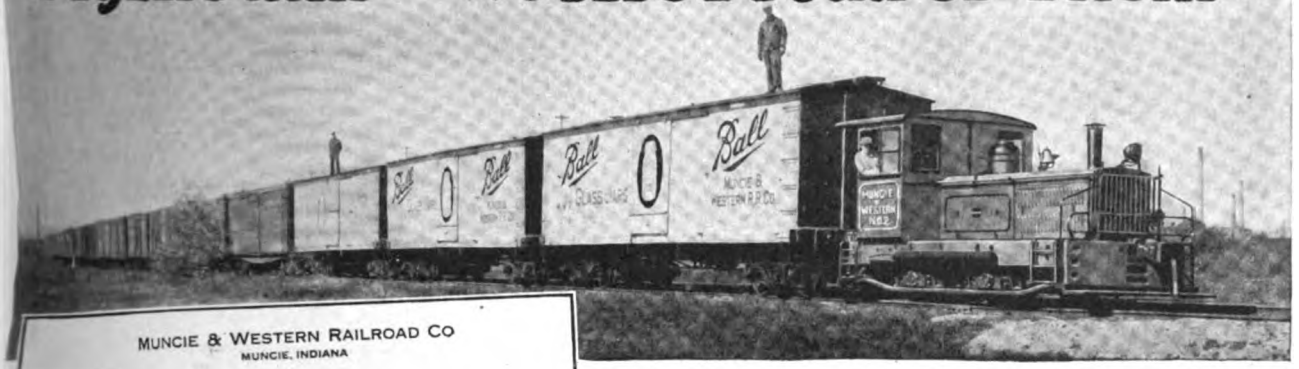
The Dust Recovering & Conveying Co.

Harvard Avenue at E. 116th St., Cleveland, O.



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"We Are More Than Pleased With Our Plymouths ~ We Are Proud of Them"



MUNCIE & WESTERN RAILROAD CO
MUNCIE, INDIANA

October 22, 1926.

Fate-Root-Heath Company,
Plymouth, Ohio.

Gentlemen:

Under separate cover I am sending you three pictures of our Plymouth Locomotive No. 2. In one of the pictures the locomotive is pulling thirty cars, most of them empty, on straight level track. The locomotive would have easily pulled ten or fifteen more cars had they been available. Our work is largely seasonal; the period of heavy tonnage having ended a few weeks ago, we only had thirty cars on track not placed for loading or unloading.

When approaching the camera the locomotive and cars came to a full stop, the locomotive then starting the cars without the slightest strain or labor, on dry track without sand.

The seventy-five ton steam locomotive owned by one of our connections, which formerly did our switching, recently got on the ground near our track, embedding itself in such a manner that it could not be rerailed with its own power. Our locomotive No. 2 rerailed the seventy-five ton steam locomotive on ninety pound rail in its first attempt, without any cars between the engines for slack.

We are more than pleased with our two Plymouth Locomotives; we are proud of them.

Yours truly,
H. Clark
General Manager



THE Ball Brothers Company, world famous manufacturers of Fruit Jars, have a big haulage problem.

Raw material must be kept moving into their plant in a steady stream, building up stock for their immense warehouses. When the shipping season opens, train loads must be dispatched promptly, smoothly—without interruption.

Last season a 20 ton Plymouth Gasoline Locomotive was put on the job, replacing a 75 ton steam locomotive. The performance was so successful an order for a 24 ton Plymouth followed.

Working fourteen to fifteen hours a day, six days a week, right through the rush season, can you blame Mr. Clark for saying:

"We are more than pleased with our two Plymouth Locomotives—we are proud of them."

No matter what the enterprise or industry, if haulage is a problem, the Plymouth will save you money. Always ready, no coal or water to haul, no "stand by" expense.

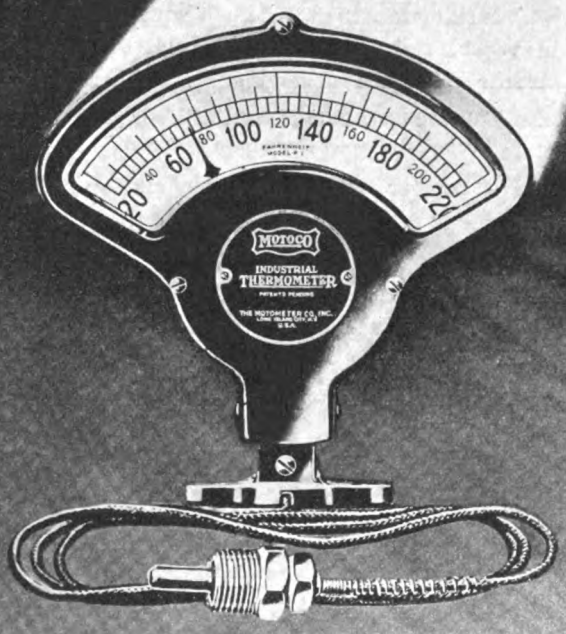
Write for Catalog and Performance Bulletins.

THE FATE-ROOT-HEATH CO.
Plymouth Locomotive Works
PLYMOUTH, OHIO

PLYMOUTH
Gasoline Locomotives

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BRINGING THE TEMPERATURE TO YOU



The industrial division offers the services of its engineering staff to manufacturers requiring thermometer equipment.

The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

MOTOCO
INDUSTRIAL THERMOMETER

Even though the point at which you must constantly check temperatures is as difficult of access as the dome of this huge vacuum pan, you can take the readings with ease, for—

The Motoco Industrial Thermometer will bring the temperature to you.

And in overcoming the factor of inaccessibility, The Motoco assures you *accurate* readings; not only because it indicates the temperature correctly, but also because it eliminates the necessity of taking the readings under adverse conditions.

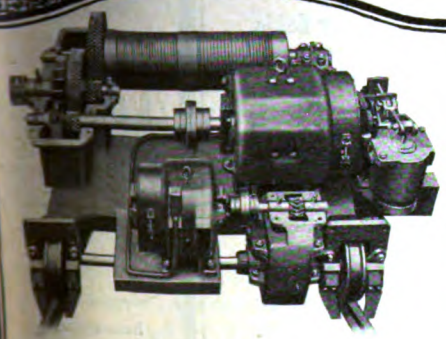
There are other factors of interest, of course; they are all described in Catalog No. 9.

The Moto Meter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.
The Moto Meter Co. of Canada, Ltd., Hamilton, Ont.
National Gauge & Equipment Division, La Crosse Wisc.

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The WHITING GOAL

To Build Not a Cheaper — But a BETTER Crane



HERRINGBONE GEAR
5-TON TROLLEY

One-piece cast steel frame practically indestructible.
Herringbone gear teeth cut from solid, much more efficient than spur gearing.
Noiseless operation insured.
Only two reductions instead of three.
Smaller rack motor; greater range of speed.
Shorter trolley length.
Bearings, bushings, oiling system, and all details of construction calculated to insure minimum maintenance and maximum reliability.

MANY efforts have been made to build cheap cranes that would be satisfactory. We have watched them with interest although we have never entered the competition in this direction. Today, more than ever in the past, we are convinced that success for the crane builder and crane user alike lies in better —not cheaper—construction.

We have grasped many opportunities to reduce manufacturing costs, and our present cranes comprise higher standards of quality at no greater cost than in past years. We hope to decrease costs still further and thereby make possible the production of a still better crane without appreciable changes in price.

The 5-ton herringbone gear trolley now being placed on the market is a step toward the Whiting goal. Full description on request.

Whiting Corporation
Harvey, Illinois
(Chicago Suburb)

WHITING

IM2-Gray

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Bad Air Is BAD BUSINESS

"Be impolite" he whispers to a clerk—and you lose a customer. "Do it tomorrow" he says to a bookkeeper and you lose a discount. "One hour till quitting time" he shouts through the factory, and production drops. "Pretty stuffy in here" he suggests to each individual customer, "Better not come back."

Almost unchallenged he stalks; and wherever he goes he drops Red Ink on the balance sheet. Yet there is—easily available—a remedy that is simple, inexpensive, sure.

American Blower Electric Ventilation will supply invigorating, oxygen-laden air to every out-of-the-way corner of the smallest store or the largest industrial building. There is a unit exactly suited to your needs and its cost is low—probably no greater and possibly less than that of adequate lighting fixtures. It can be installed in a day or so—it won't disturb business.

Ask for details. For 46 years we have been helping others throw off the costly handicap of Bad Air, and *always* the returns are big. Just phone your electrical contractor or mail coupon. It will pay you to get the facts—and they cost nothing.

AMERICAN BLOWER CO., DETROIT
Branch Offices in All Principal Cities
Canadian Sirocco Company, Ltd., Windsor, Ont.

Frequency of Air Changes Necessary for Various Applications*

Offices	5 to 10 minutes
Toilets	3 to 5 minutes
Bakeries	3 minutes
Cabins	5 minutes
Tunnels	1 to 10 minutes
Projecting Booths	2 minutes
Laboratories	3 to 10 minutes
Conduits	1 to 10 minutes
Ship Holds	10 minutes
Kitchens (Home)	2 to 3 minutes
Laundries	5 minutes
Theaters	5 to 10 minutes
Assembly Halls	5 to 10 minutes
Garages	5 minutes
Dining Rooms	5 to 15 minutes
Machine Shops	15 minutes
Lodge Rooms	10 minutes
Foundries	5 to 10 minutes
Retail Stores	5 to 15 minutes

*This table based on climatic conditions in Central United States. Other tables for specific localities are available.

C O U P O N

AMERICAN BLOWER CO., DETROIT, MICH.
Send details relative to the application of American Blower Electric Ventilation to

(*Business*)_____
*Name*_____
*Address*_____
*City and State*_____

© 1927 A.B.Co. (587)

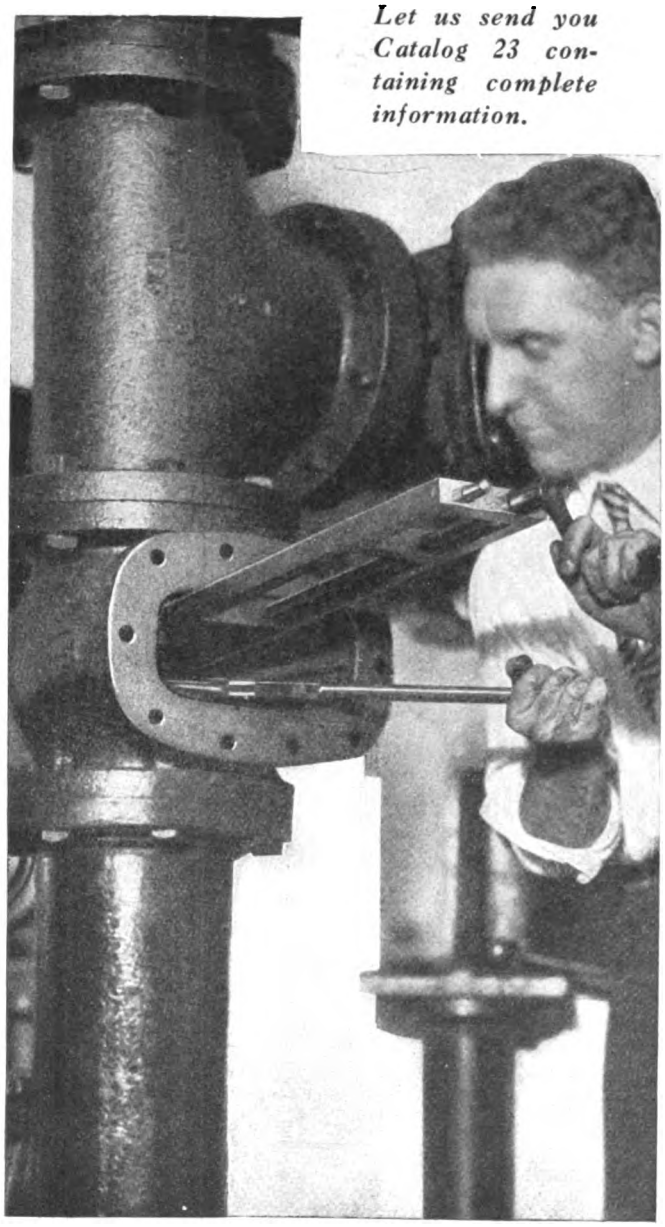
American Blower
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

GOOD VENTILATION IS ONLY GOOD BUSINESS

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A DEXTER Gate Valve Reseating Machine quickly pays for itself by keeping gate valves steam and fluid tight. Dexter Outfits for globe, gate and pump valves will save you time, valves, steam and repair expense.

Let us send you Catalog 23 containing complete information.



THE LEAVITT MACHINE CO.

28 East River Street, Orange, Mass., U. S. A.

Canadian Agency: Darling Bros., Ltd., 120 Prince Street, Montreal.

British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne.

Valve Reseating Dexter Machines

527



"Washing removes th dirt—*but not the paint*"

Says manufacturer of well known paint product

"TRY to wash ordinary white paint," he say "Does the dirt come off? Does the pai stay on? *You can wash.....clean any numb of times without the least injury to its lustro white surface."*

Any paint that will bear washing will wash *bett* with OAKITE than with other materials. Fa tories and mills everywhere have been using it f 18 years. OAKITE contains no grit, alkali soap. It is ALL cleaner! It rinses easily a quickly. One-half to one ounce of OAKITE in pail of warm water will freshen and bright painted walls, ceilings, woodwork or equipme There will be no discoloration or streaks.

And best of all washing with OAKITE is l in cost.

One of our service men is near you. Ask to have him and show you, in a practical way, how you can save mo by using Oakite for all factory or mill cleaning.

OAKITE IS MANUFACTURED BY

OAKITE PRODUCTS, INC., 40A Thames St., NEW YORK, N

(Formerly OAKLEY CHEMICAL CO.)

Oakite Service Men, cleaning specialists, are located at

Albany, Allentown, Pa., *Atlanta, Ga., Altoona, Pa., Baltimore, Birmingham, *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chi *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, *D ver, *Des Moines, *Detroit, Erie, Flint, Mich., Fresno, Cal., *Grand Rapid Harrisburg, Hartford, *Indianapolis, Jacksonville, Fla., *Kansas City Los Angeles, Louisville, Ky., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Omaha, Neb., *Oakland, Cal., Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, South Bend, Ind., *St. Louis, Springfield, Ill., Syracuse, *Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Ia., Worcester.

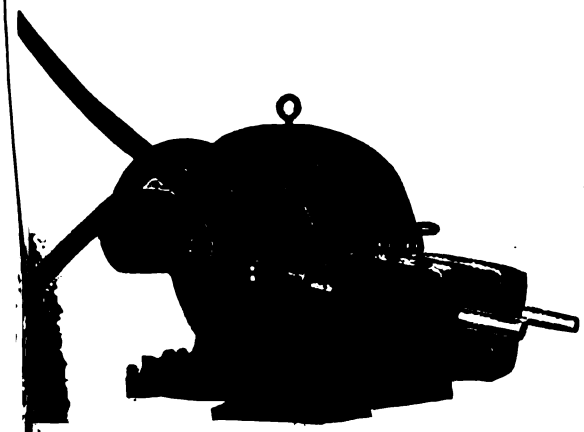
**Stocks of Oakite Materials are carried in these cities.*

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Meth

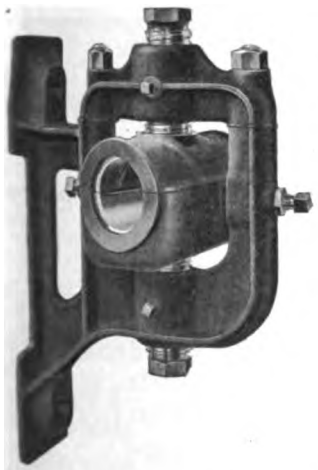
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ANOTHER WAY TO GREAT SAVINGS —

"We Have Just Ordered Another!"

Wherever the U. G. Belt Contactor is in use it lives up to its promises of economical performance. It eliminates the usually present difficulties experienced with long belt drives along with the waste and wear and loss of power.



Read what the Union Mining Co., Mt. Savage, Md., says regarding this efficient little power transmission unit.

"This drive is giving us such wonderfully good service that we have just placed an order with you for a second contactor, which we hope will work out as well as the one now in use."



Because its adaptability to many and varied industries has been proven, and because of the commendation of its users, we say the U. G. Short Center Belt Contactor will save for you, too,

Power Belts and Floor Space

T. B. Wood Sons Co.

Chambersburg, Pa.

NEW ENGLAND BRANCH: Cambridge, Mass.

SOUTHERN BRANCH: Greenville, S.C.

Makers of Power Transmission Machinery Since 1857



ECLIPSE BRITEN-ALL

An Economical, Lasting, White Finish

Most factories, mills and warehouses desire a white finished wall, but in most cases a white finish will not last any great length of time without being washed or repainted.

ECLIPSE "Briten-All" gives a finish as white as the most expensive wall paint, **yet it costs much less.** It is easy to apply, requires only one coat and adheres firmly to the surface for a long time.

ECLIPSE "Briten-All" is intended for all classes of interior work where light reflecting and brightening-up standards are paramount. In fact, some concerns find it more efficient, from a light diffusing standpoint, to finish their walls with ECLIPSE "Briten-All" every one or two years instead of washing them—and more economical, too.

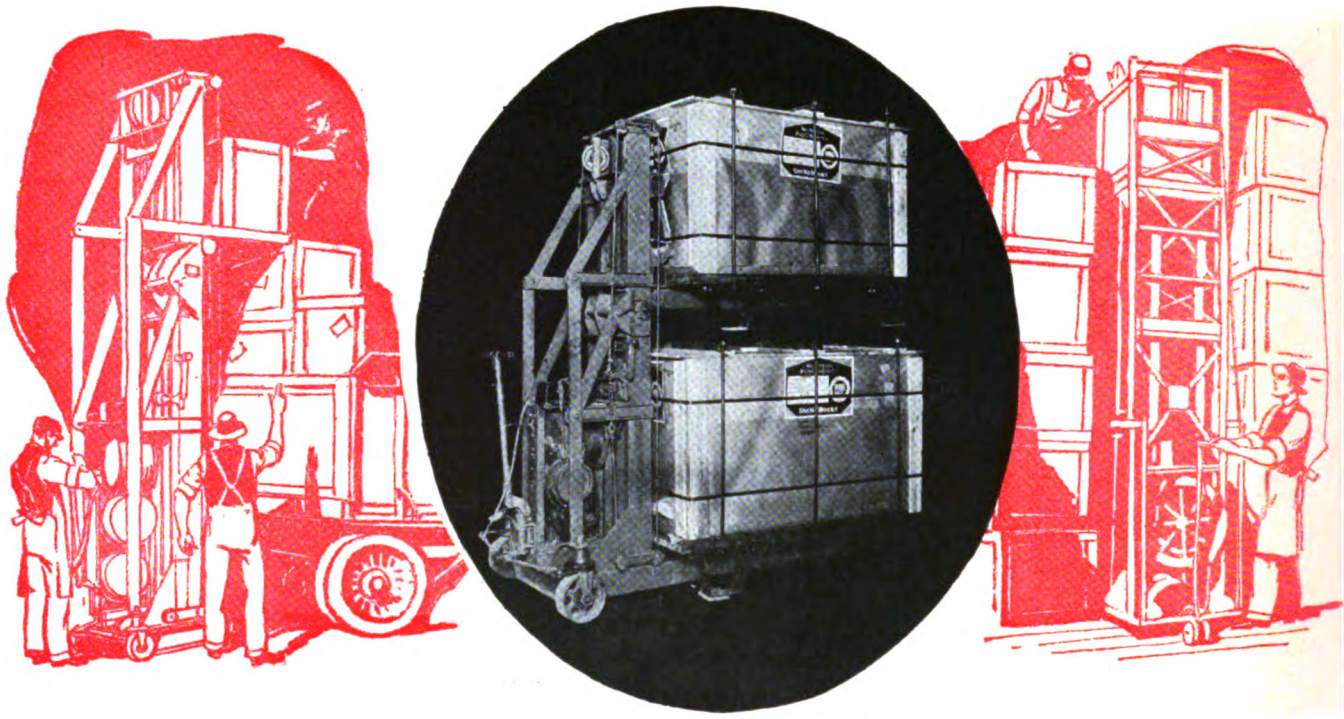
You receive one-hundred cents worth of wear for every dollar you spend for "Briten-All" and your walls will be whiter and cleaner.

Detailed information with sample panel gladly sent on request.

The Eclipse Paint & Mfg. Co.
Cleveland, Ohio, U.S.A.

Dallas Denver
Philadelphia San Francisco
Newark
Charlotte, N. C.

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Lewis-Shepard Company, Boston, Mass., build Hyatt equipped Stackers and Hyatt equipped Jack Lift Trucks

Hyatts make light of heavy lifting!

Lewis-Shepard Stackers use Hyatt Roller Bearings to banish the friction load which ordinarily accompanies heavy lifting jobs. This conserves all the power for lifting and loads up to 5000 pounds can be handled quickly and efficiently.

Hyatts are giving the same high grade frictionless service in other material handling equipment. They guard effectively and permanently against delays, breakdowns and irregular service. They operate for months without renewal of lubricant—and for years without any other attention.

Why not keep your loads moving more easily and cheaply by specifying Hyatt Roller Bearings? Nearly all the leading makes of stackers, trucks, trailers and casters are Hyatt equipped.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh
Worcester Philadelphia Charlotte
Oakland Cleveland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

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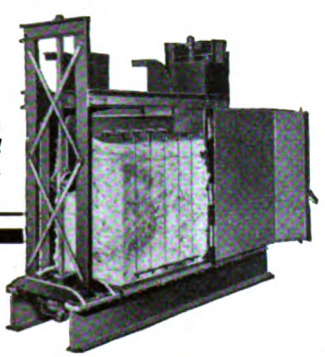
"The SAMSON of BALERS"

Power — Speed — Efficiency — Durability. These features distinguish the SCHICK Baler wherever it performs. All baling operations are simplified by its use. In compression force particularly—as applied to paper, excelsior, rags, wood and metal scrap—the SCHICK Baler excels. It is a veritable Samson of power.

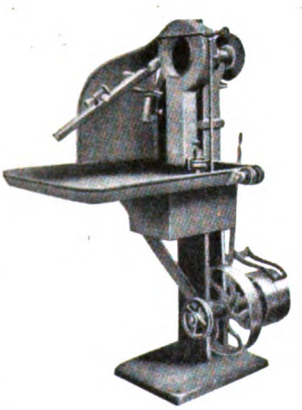
Schick Balers are all-steel and made in 8 sizes: Hand balers, 125 to 375 lbs. capacity; Power balers, 350 to 1500 lbs. capacity. Depend on a SCHICK for every baling need.

DAVENPORT MFG. COMPANY
Dept. R,
Davenport, Iowa

Write Dept. R for interesting catalog and prices. No obligation.



AMERICAN DRILL GRINDER



The American Drill Grinder sharpens drills from ⅛" to 3½". For wet or dry grinding.

Speed of wheel spindle, 1700 R.P.M. Speed of counter, 425 R.P.M. Height of machine 49". Floor space 25" x 40".

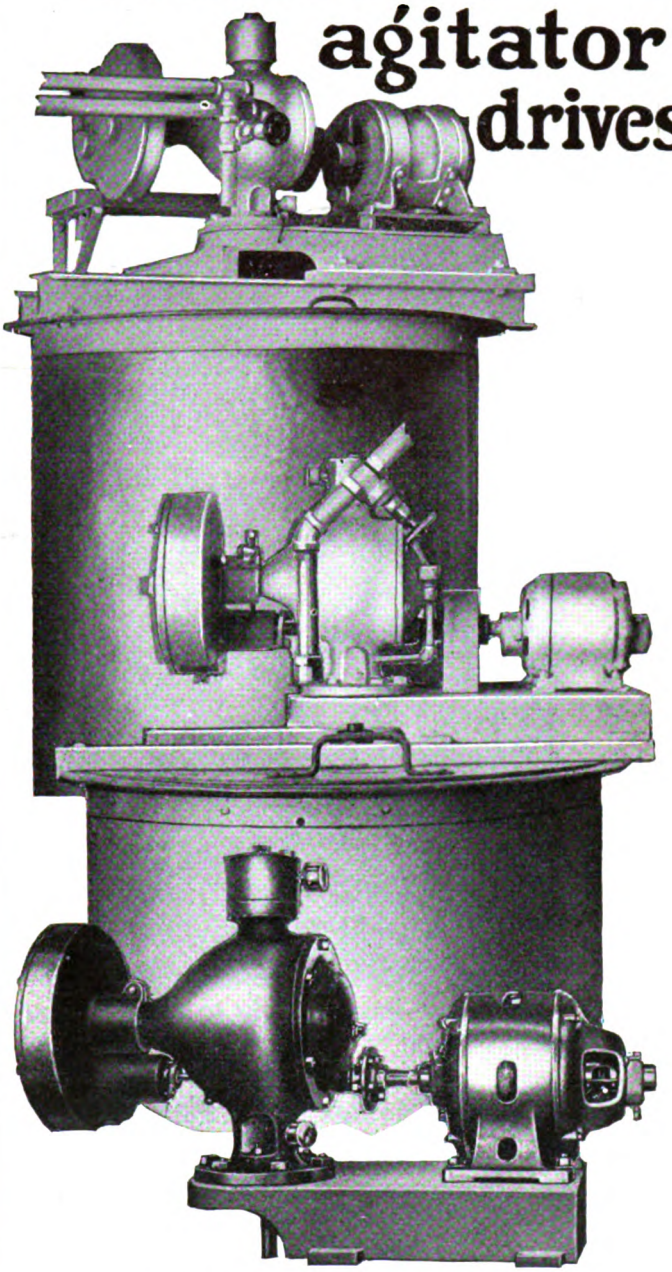
Efficient—Under Skilled or Unskilled Operation

So simple of operation is this improved grinder that even a boy can quickly learn to handle it proficiently—and economically. Hand adjustments are eliminated by the patented Lip-Rest, which automatically locates the cutting edge when a new drill is inserted. Rapid, accurate and versatile, an American Drill Grinder is a real profit maker in the busy shop.

Circulars and prices on request

LA SALLE TOOL COMPANY
La Salle, Illinois, U. S. A.

standard agitator drives

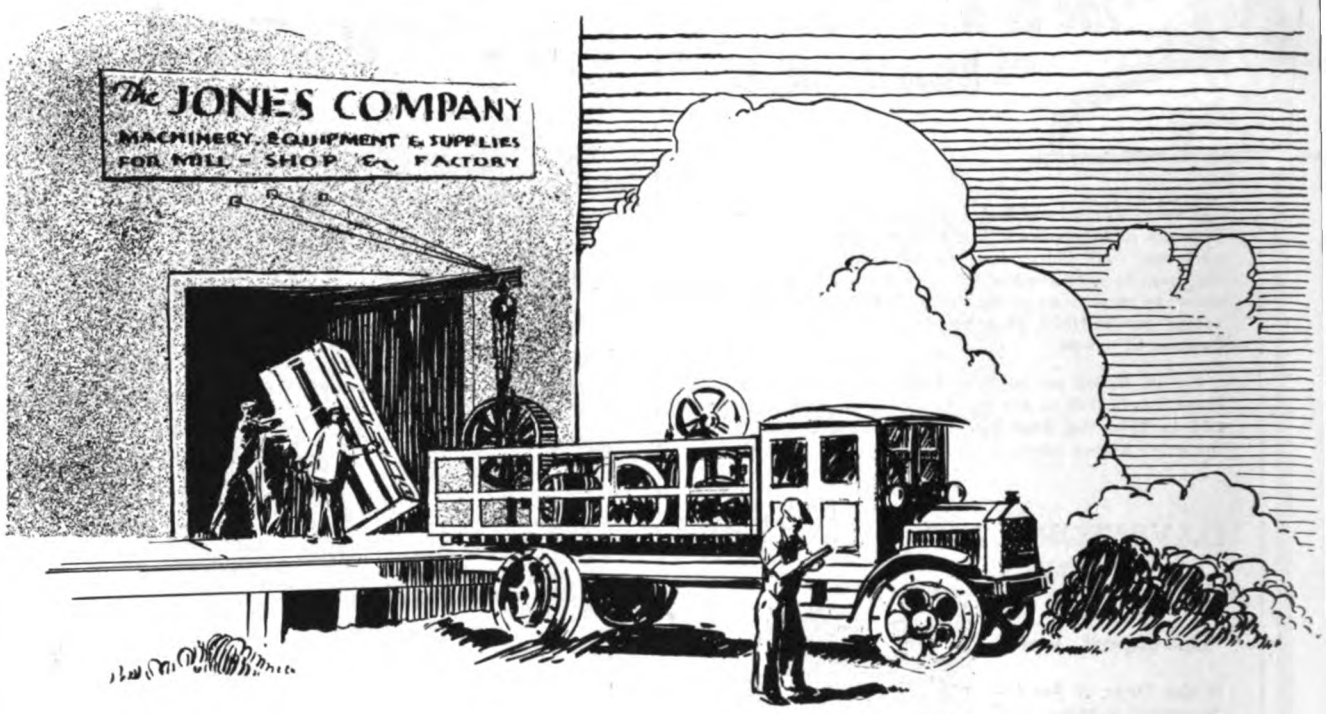


A unit for every stirring and agitating purpose—simple—rugged—adaptable.

Send for complete Information and Specifications

NEW ENGLAND TANK & TOWER CO.
EVERETT, MASS.
NEW ENGLAND (enclosed) & NETT-CO. (open)
Agitator Drives
30 Church St., New York

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Buy from your local Mill Supply Distributor

A grinding wheel breaks, production must be maintained. You grab your phone and the local mill supply dealer delivers another one immediately to take its place.

Belting must be replaced. The local dealer, from his large stock on hand, cuts down the time that the machine, or machines are out of service.

Many times during the week or month, the mill supply distributor has helped you in an emergency. He maintains a large stock of equipment, tools, machine parts, hoists and other handling machinery, maintenance equipment, etc., on hand ready to give you prompt service.

Remember this when you buy equipment, machinery and supplies;

Your local dealer anticipates your wants and in order to do so, he keeps large stocks on hand, representing thousands of dollars invested. He is rendering an invaluable service to industry and is worthy of your patronage.

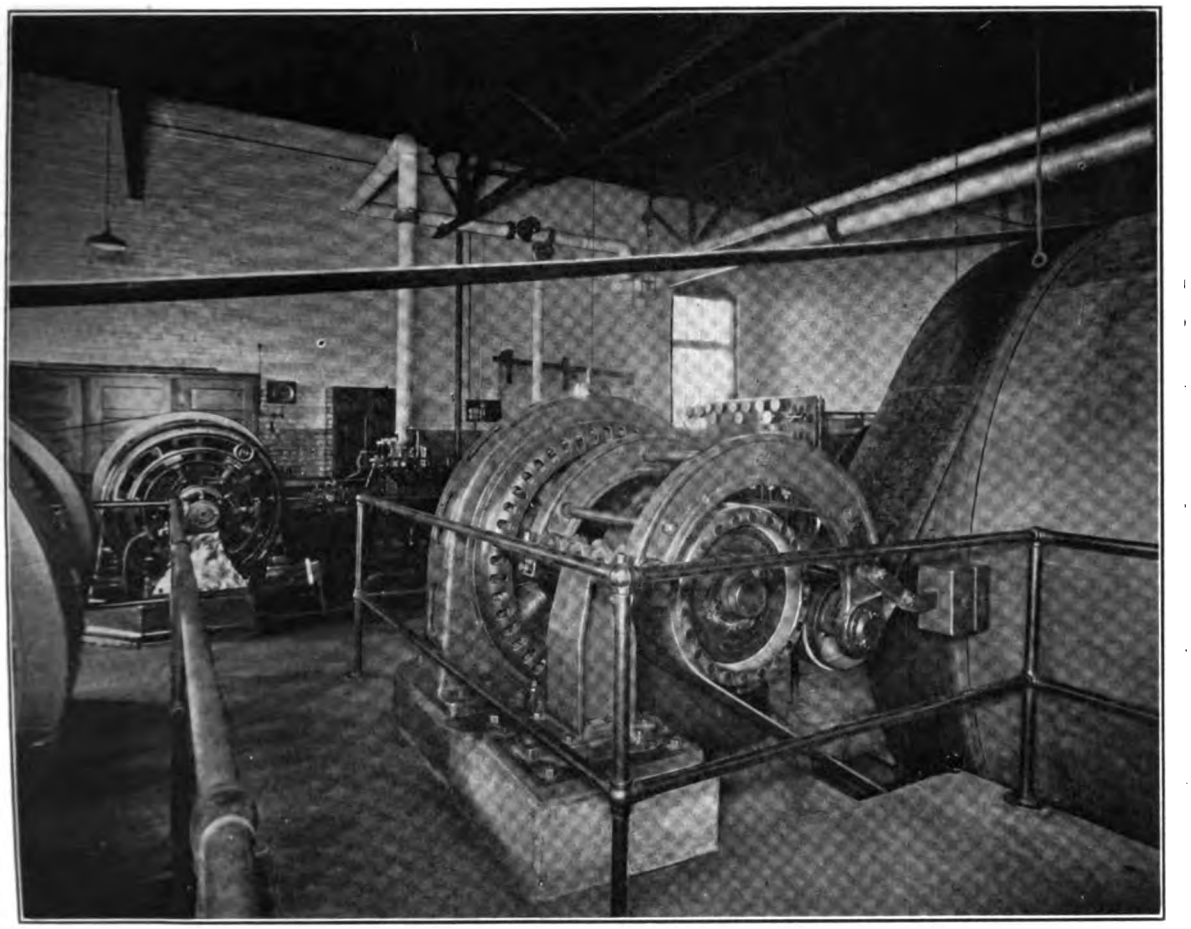
Buy from your local machinery and mill supply distributor.

[*One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor*]

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The LENIX Drive

(Trade Mark Reg.)



Engine driving 150 k. v. a. alternator. Driving pulley 12ft. dia. x 52in. face, 104 r. p. m. Driven pulley 25in. dia. x 22in. face 600 r. p. m. Horizontal center distance 10ft. 0 in. Belt 20 in. wide, double leather.

Crowded Engine Room—Underloaded Engine

5 Points

1—The LENIX increases the arc of contact between belt and pulley.

2—The LENIX maintains constantly and accurately the proper tension in the slack side of the belt.

3—The LENIX saves floor space, building space and belting because of freedom in pulley locations.

4—The LENIX saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The LENIX permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratio.

This was the situation facing a client considering the installation of a new generator, which simply had to go in. The full width of the main engine flywheel was occupied by one 30" main lineshaft belt and one 16" countershaft belt, running in opposite directions. With this arrangement the engine could only be loaded to two-thirds of its full capacity. The problem was to make the full capacity of the engine available in the limited space of the engine room.

The Lenix engineer recommended the installation of the new 150 KVA alternator in the space between the main engine and the countershaft. The new alternator belt was placed under the countershaft belt as shown thus making the countershaft belt run on top of the alternator belt on the engine flywheel. This arrangement, incidentally, improved the efficiency of the countershaft drive.

This installation has been in satisfactory service for more than three years.

A number of Lenixes are still in daily service after nearly twenty years of operation. This is proof of the reliability and the soundness of design and construction of the Lenix. Our experience, the result of twenty-one years in designing and building Lenix Drives for installations ranging from 1 H.P. to 1400 H.P. is offered for the solution of your belt drive problems.

A card will bring you full information.

F. L. Smidth & Company, Inc., *Engineers*

50 Church St., New York, N. Y.

When writing advertisers please mention Industry Illustrated

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WHERE to PURCHASE MODERN EQUIPMENT *for Mill Shop & Factory*

BEARINGS. Transmission and Line Shaft

Engineering Data on Anti-friction Bearings that permit higher speed at the lowest friction loss. See page 33. The New Departure Mfg. Co.

Bearings that make heavy lifting lighter. Hyatt Roller Bearing Company. See Colored Advertising Section.

An Oilless Bearing is described on page 36 by the Arguto Oilless Bearing Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 51.

Complete Details can be obtained on a Motor that gives long service. See page 113. Master Electric Company.

Descriptive Bulletin explains the complete line of motors from one-quarter to forty H.P. single and polyphase Manufactured by the Valley Elec. Co. Page 110.

Descriptive Bulletins on Motors for practically every purpose are offered by Diehl Manufacturing Company. See page 68.

Electrical Starters and Control Apparatus that protects man, motor and machine. See page 77. The Cutler-Hammer Mfg. Co.

For pushbutton control of electric motors without extra cost see page 38. The Triumph Electric Co.

Information on a Drop Cord System that saves its cost many times in lamp renewals. See page 115. Appleton Electric Co.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 78.

A Copy of The Motor Book contains interesting information on modern construction of motors. See Colored Advertising Section. The Lincoln Electric Company.

More Production through better lighting. See Colored Advertising Section. National Electric Light Association.

The U-Re-Lite Hand Book is a 96-page treatise on electrical control. For a copy see Colored Advertising section The Cutter Company.

50 Different Motors for 50 Special Jobs is partly illustrated See Colored Advertising Section. The Domestic Electric Company.

MAINTENANCE

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 119.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 34. The Nitrose Company.

Catalog No. 100 is a 32-page book on air moving. See page 79. New York Blower Company.

An Interesting Booklet and Sample of a Waterproof, Acid, Alkali and Brine Resisting Paint. American Asphalt Paint Co. See page 49.

A Catalog, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 116. Durand Steel Locker Co.

Automatic Fire Doors are described on pages 30-31 by Richards-Wilcox Mfg. Co.

Barreled Sunlight for Industrial Painting is described in the bulletin of the U. S. Gutta Percha Company. See page 3.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method See page 37. The Vortex Manufacturing Co.

Brushes for every industrial purpose. Also brooms. See page 4. The Osborn Mfg. Co.

Information on Scientifically prepared protective Coating for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

Window Walls that Aid Production. See Colored Advertising Section. Detroit Steel Products Company.

Applications of Electric Blower Ventilation are described See Colored Advertising Section by American Blower Company.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co. See Colored Advertising Section.

A Quick Method of Painting Walls is shown. See Colored Advertising Section. The Eclipse Paint & Mfg. Co.

MATERIALS HANDLING EQUIPMENT

Hand Trucks that are noted for exceptional strength and flexibility. See page 117. Fairbanks Co.

A New and Improved Concrete Mixer, The Lansing 7S. See page 117. Lansing Company.

A New Track Unloader that fits right on to the coal car is described on page 80 by the Chicago Automatic Conveyor Company.

"Seven Economies of Logan Conveyors" i... ...dling at lower costs. See page 1. Lo...

Any Type of Truck or Caster can be ...

Floor Saving Wood Wheels made by the Metzgar Company, Inc. See page 76 Booklet offered.

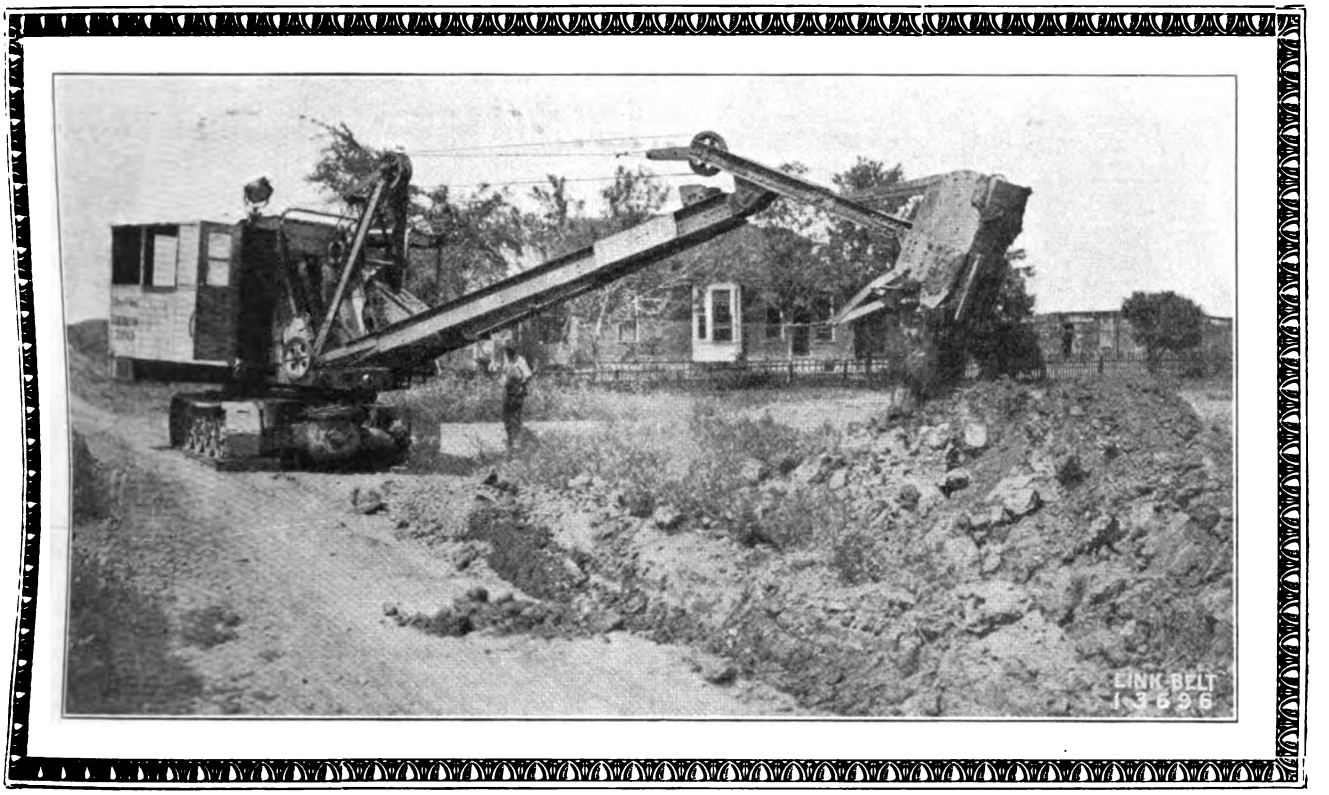
Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 114.

An Automatic Weighing and Sacking Scale that weighs and fills five sacks per minute. See page 66. Richardson Scale Company.

A Special Hy-Lift Truck is described on page 111 by The Baker Raulang Co.

"The Atlas of Mechanical Handling" is a book containing information on overhead carrying systems which appli...

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Link Belt Crawler Crane with ditcher attachment, equipped with No. 7044 Twin Disc Clutch

TWIN DISC CLUTCHES



HANDLING heavy loads steadily and surely, with frequent starting and stopping, Twin Disc clutches absorb strains, protect the engine, increase the output and lengthen the life of any machine on which they are used.

All the advantages of smooth engagement under load, immediate, complete release, minimum upkeep expense and continuous faithful service can be secured at a conservative price by the use of Twin Disc clutches. Consult with our Engineering Department.

PARTS STATIONS

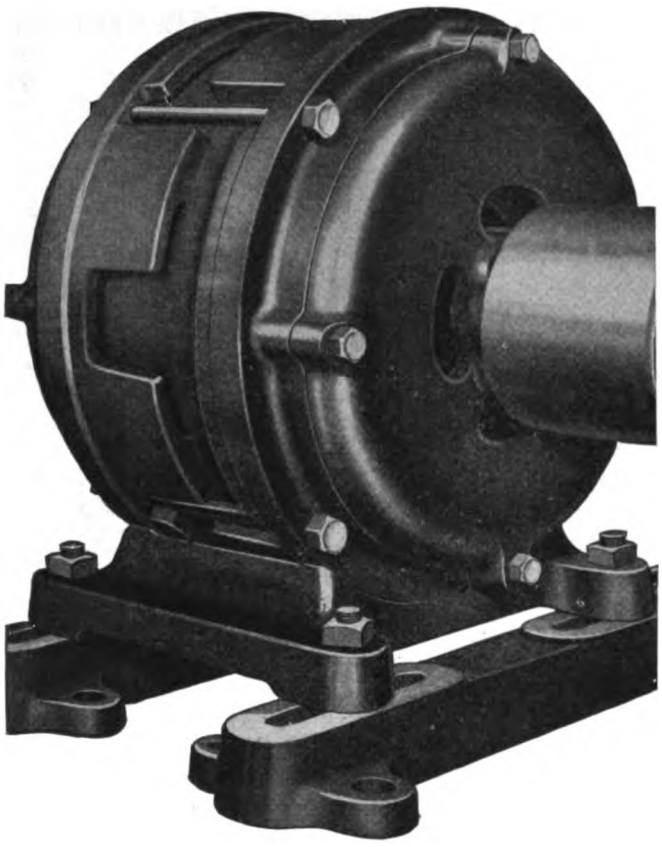
San Francisco—F. Somers Peterson Co., 57 California St.
Los Angeles—Coast Machinery Corporation, 406 E. Third St.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Ave.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.
Tampa, Fla.—Motive Parts Co. of Florida, Inc.
Detroit—Whitney Brothers, 6464 Epworth Blvd.
New York City—E. George & Co., Broome & Wooster Sts.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie St.
Cleveland—James R. Howell, 6715 Quimby Ave.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.
Buffalo, N. Y.—Edward W. Rode, 45 A. St.

TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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Don't pet them— Forget them!

VALLEY MOTORS don't have to be petted and coddled like a nervous child or a tempermental grand opera star. The hardened steel ball bearings require little or no attention. Many users clean and oil the bearings only once a year.

The rest of the time Valley Motors just keep right on working—proving to their owners that they cost less to operate . . and do more.

Polyphase ¼ to 40 h. p., and Single Phase ¼ to 3 h. p. Write for descriptive bulletin.

VALLEY ELECTRIC CO., ST. LOUIS, MO.

***District Offices:* Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco**

Valley

For product

the railroad principle of two rails. Colored Advertising Section. The Atlas-Chicago Co.

A Lift Truck with Knuckled Steering Wheels. See page 46. C. A. Graham.

Bulletin 25-D describes a lift truck with a short turning radius. See page 48. The Lakewood Engineering Company.

A Nationwide Service is offered by the Link-Belt Company for economical handling of materials and transmission of power. See page 120.

A Handy Tool for Moving the Heaviest of Railroad Cars. For information see page 53. The Advance Car Mover Company.

A Light Weight Substantial and Highly Efficient Electric Hoist that can be used anywhere that a chain block is used. See page 53. Roeper Crane & Hoist Wks., Inc.

Four Different Types and Fifteen Different Models of Tractors are described in Bulletin 106. Other bulletins are offered: A100 showing all purpose Industrial Trailers. A125 and A120 also give complete descriptions of their line of trailers for every industrial requirement. See page 42-43. Mercury Manufacturing Company.

Fifty Years of Service to Industry in the field of Materials Handling is the record established by The Jeffrey Manufacturing Company. See page 45.

An Ex-ray Picture of an Electric Hoist is shown on Back Cover by Shepard Electric Crane & Hoist Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 111.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 78. Canton Foundry and Machine Co.

Chain Block Facts is contained in a booklet offered by The Yale & Towne Manufacturing Company. See Colored Advertising Section.

The New Material Handling Book issued by The Louden Machinery Company contains 56 pages of dimensional drawings and 72 pages of mono-rail applications. See Colored Advertising Section. The Louden Machinery Company.

G 65 Is a Booklet explaining the vital necessity for speed flexibility of transmission drives. Reeves Pulley Co. See Colored Advertising Section.

Factory Certified Wire Rope for materials handling purposes See Colored Advertising section. Williamsport Wire Rope Company.

Bulletins describing the Pneumatic Conveying of granular injurious, dusty materials can be obtained from the Dust Recovering and Conveying Co. See Colored Advertising Section.

Gasoline Locomotives that give tremendous power with bi economy in operation and upkeep. See Colored Advertising Section. The Fate-Root-Heath Co.

A 5-ton Herringbone Gear Trolley is an improvement introduced in the Whiting Corporation Cranes. See Colored Advertising Section.

POWER PLANT EQUIPMENT AND AUXILIARIES

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations. Nash Engineering Co. on page 6.

Catalog Describing a Boiler Feed Water Regulator can be obtained from the Chaplin-Fulton Mfg. Co. See page 6

Catalog and Price Lists on Steam Unions that prevent lo can be obtained from the E. M. Dart Mf See page 79.

ings, High Temperature Cements, etc., th See page 41. Johns-Manville Corporatio

booklet R-135, and the new Packless In R-153 are offered by Sarco Company, In

team Trap on 60 days free trial. See page 1 gineering Co.

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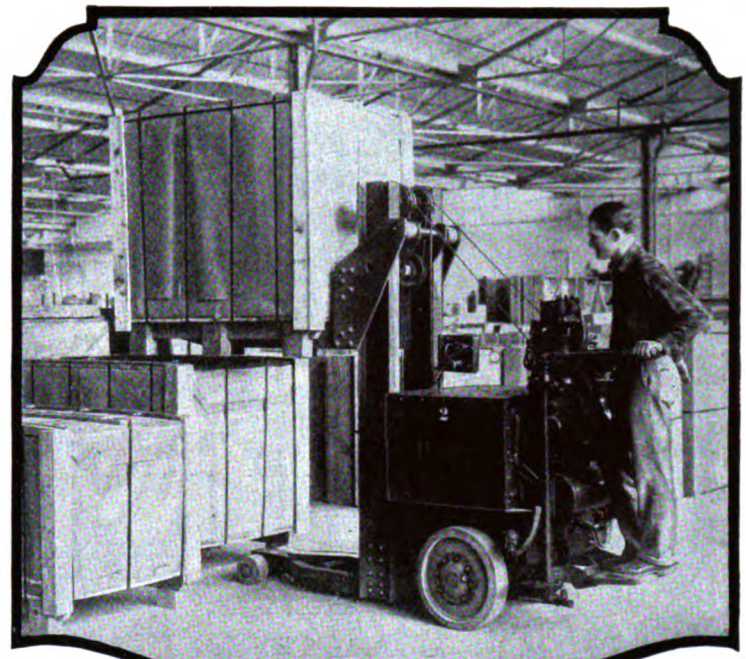
Dependability–Low Cost

FIRST hand experience with different types of Baker trucks is behind this statement of the Champion Coated Paper Company.

"Although several of the trucks have been in almost constant use day and night, month after month, they are standing up in a remarkable manner and with surprisingly low cost."

Baker tractors, trucks or cranes can prove one of the best types of labor saving equipment in your plant also.

THE BAKER RAULANG CO.
2179 West 25th St., CLEVELAND, OHIO



ELECTRIC TRACTORS AND TRUCKS

Baker

TRADE-MARK REG. U.S. PAT. OFF

A special Baker Hy-Lift Truck handling loaded skids at the Champion Coated Paper Co., Hamilton, Ohio



Weigh as You Convey and Eliminate Losses

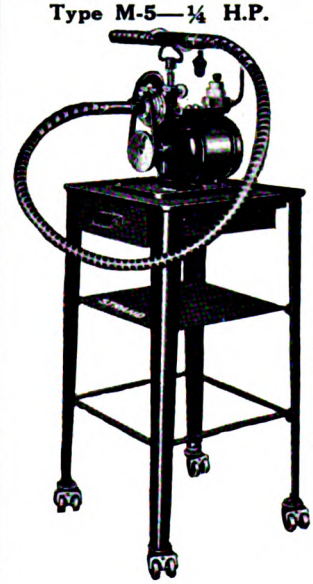
What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.
180 Autumn St. Passaic, N. J.

Type M-5—¼ H.P.



Strand

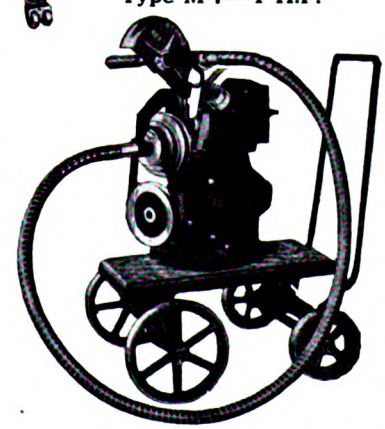
FLEXIBLE SHAFT MACHINES

Are reducing costs on many operations in

Grinding, Polishing, Rotary Filing, Buffing, Sanding, Scratch Brushing, Screw Driving and Nut Setting

Made in several types and sizes.

Type M-7—1 H.P.

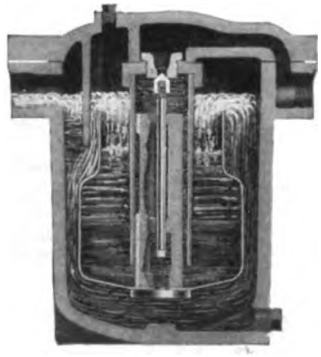


Manufactured by
N. A. STRAND & CO.
CHICAGO

Main Office and Factory
5001-5009 NO. LINCOLN ST.

Send for catalog

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ILLINOIS Eclipse Steam Trap

Shipped Prepaid on 60 Day FREE Trial

Engineers, if *you* have a "worst service" *that's* the place to put an *Eclipse* Trap for a test!

Under ordinary conditions most any trap will operate reasonably well for a while, but—it is the severe condition—the *worst service*—that shows how an Eclipse will end your trap troubles.

The Eclipse is not "just another steam trap." Its valve action makes it the OUTSTANDING Steam Trap of the Day!

No Other Trap Has This Feature

The valve action is SNAP action. It is either tight closed or wide open. Never cracked on seat. Wire drawing impossible.

Other Features: Can't blow steam or air-bind. No complicated levers—only TWO moving parts.

This coupon brings prepaid an Eclipse Improved Steam Trap for 60 day free trial.

MAIL IT TODAY

ILLINOIS ENGINEERING COMPANY
21ST AND RACINE AVE., CHICAGO

Please ship prepaid an ILLINOIS Eclipse Trap for 60 day free trial. It is understood that this is to be of *no* expense to me and that after testing the trap I may return it WITHOUT QUESTION.

Size of pipe connections .....Trap capacity.....

Maximum steam pressure .....

Firm .....

Address .....

.....

Signed .....Position .....

☐Send trap bulletin only.

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPORATED 1900
CHICAGO

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

A Free Trial Offer of safety saws can be obtained by D. W. Onan & Sons. See page 50.

A Saw for the Shipping Room at a lower price. See page 38. The Parks Ball Bearing Machine Co.

A New Catalog showing complete line of bench wood-working machines. See page 68. Heston & Anderson.

Screw Drivers, forged in one piece from handle to tip. See page 64. American Saw & Manufacturing Company.

A Buying Guide for Quality Equipment is to be had in the Brown & Sharpe Mfg. Company, Catalog No. 30. See page 44.

A Shovel that is tougher, harder and yet lighter than any other make. See page 32. The Wood Shovel and Tool Company.

Sample Blades are Offered by Victor Saw Works. See page 46.

High Speed Drills with forty-five years' experience behind them. See page 53. The Standard Tool Company.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 60.

Catalog 57B describes a Vise with seven distinct and exclusive features of construction. See page 64. The Charles Parker Company.

A Spiral Fluted Expansion Reamer. See page 70. The Morse Twist Drill & Machine Co.

New Ideas for Milling and Grinding Jobs. See page 55. The Cincinnati Milling Machine Company.

A Sample of a New Steel Covered Acorn Nut Patented by Ferry is described on page 67 by The Ferry Cap & Set Screw Company.

Tool Holders for lathe, plainer, shaper and slotter are described on page 40. Armstrong Brothers Tool Co.

A Moisture Separator that adds years of life to pneumatic tools. See page 52. Independent Pneumatic Tool Company.

Set Screws that are 30% stronger. The Allen Mfg. Co. See page 78.

An Interesting File Catalog and Price List can be obtained from the Simonds Saw and Steel Co. See page 47.

High Speed Drills for high speed production. See page 65. The Cleveland Twist Drill Co.

Chrome Vanadium Wrench Kits for Millwrights, Loomfixers and other Shop Mechanics. See Bonney Forge and Tool Works. Inside Front Cover.

Bulletin 317-B describes a bending roll machine. See Colored Advertising Section. Buffalo Forge Company.

Chrome-Molybdenum "Superrenches" are described on Colored Advertising Section by J. H. Williams & Co.

An Iron That Resists Rust, acid and Corrosion. See page 116. Ludlum Steel Co.

Circulars and Prices on a drill grinder that an unskilled mechanic can operate.

Literature on Flexible Shaft Equipment, unexcelled for Hard-To-Get-At places, is offered by R. G. Haskins Co. See page 116.

TRANSMISSION EQUIPMENT. Including Belting

Catalog No. 26 gives information about correct alignment of motor and reducer shaft. W. A. Jones Foundry & Machine Co. See page 71.

Information on a Short Center Drive is offered by F. L. Smidth & Company, Inc. See page 107.

Cast Iron Pulleys that are used for hundreds of different purposes. See page 61. Pyott Foundry Company.

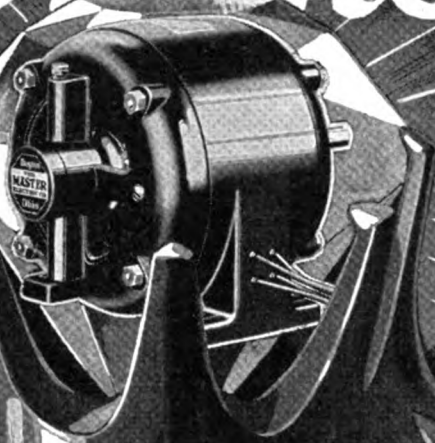
A New Disc Clutch for the first time on the market is shown on page 62 by the Conway Clutch Company.

A Book on Live Leather Belting is offered by I. B. Williams & Sons. See page 35.

Medart Catalog No. 43 and Discount Sheet cover dimensions, details and list prices of the entire range of power trans-

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A POWER Diamond!



Just as a real diamond retains its value—so MASTER GUARANTEED MOTORS through years of constant service upon a large variety of applications have come to be known as "Power Diamonds," capable of rendering service today, tomorrow—*every day.*

THE MASTER ELECTRIC COMPANY
Linden & Master Aves. Dayton, Ohio

STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

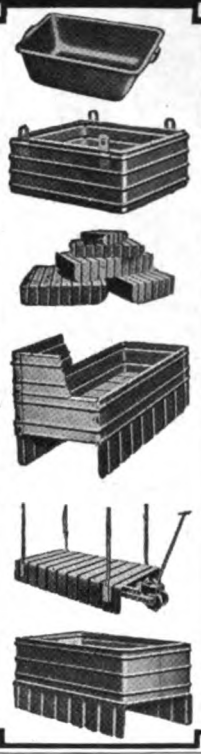
⅛ TO 7½ H.P.

Dayton THE MASTER ELECTRIC CO. Ohio

Less than 40°

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POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



Improved Handling Methods

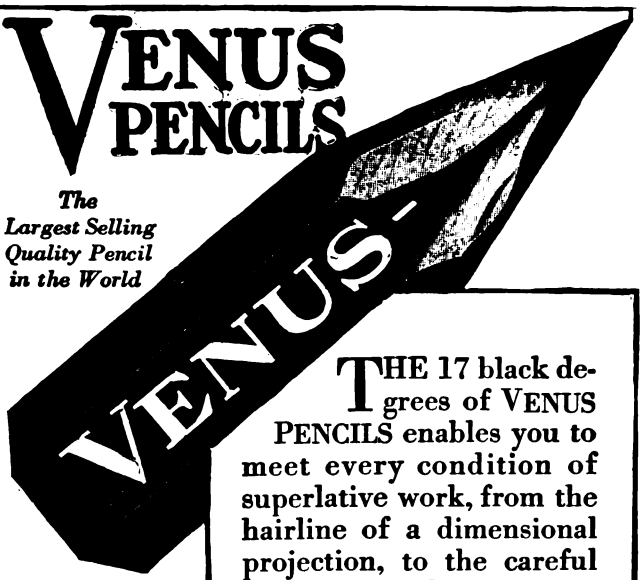
MANY of America's greatest industries, and small plants as well, are effecting surprising economies in material handling, by the intelligent selection and efficient use of POWELL Pressed Steel Material Handling Equipment. We manufacture a large line of Platforms and standardized containers for material handling and storing.

Complete illustrated literature and prices will be sent gladly upon request.

The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

VENUS PENCILS

The Largest Selling Quality Pencil in the World



THE 17 black degrees of VENUS PENCILS enables you to meet every condition of superlative work, from the hairline of a dimensional projection, to the careful shading of a sketch.

17 black degrees, 3 copying

For bold, heavy lines	6B-5B-4B-3B
For writing, sketching	2B-B-HB-F-H
For clean, fine lines	2H-3H-4H-5H-6H
For delicate, thin lines	7H-8H-9H
Plain Ends, per doz.	$1.00
Rubber Ends, per doz.	1.20

At Stationers and Stores throughout the World

Also makers of UNIQUE THIN LEAD COLORED PENCILS *12 colors— $1.00 per doz.*

American Lead Pencil Co.
224 Fifth Avenue, New York

Write for Free Sample of Venus Unique Pencils

mission equipment made by The Medart Co. See page 54.

Copy of L. H. Hopkins' Article, "Group Drives, More Economical for Most Conditions." Chas. A. Schieren Company. See Colored Advertising Section.

Catalog and Special Bulletins on self-oiling roller bearings. See page 73. Dodge Manufacturing Corporation.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 74.

Twin Disc Clutches that meet quantity production requirements of large and small machine tools are described on page 109. Twin Disc Clutch Company.

A Line Shaft Ball Bearing Hanger that requires oiling only twice a year is shown on page 39 by S. K. F. Industries.

A New Belt Lacer that laces an eight inch belt in one and one-half minutes. See pages 56-57. Clipper Belt Lacer Co.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 111. N. A. Strand & Co.

A 60-Day Trial on a Belt Preservative. See page 117. Cling-Surface Company.

A Means of Saving in Power and Transmission is shown. See Colored Advertising Section. T. B. Wood Sons Co.

"How, When and Where to Use Burmaline Belting" can be obtained from The Burrell Belting Co. Page 2.

MISCELLANEOUS

"Horton Tanks for Fire Protection," is the name of the booklet put out by the Chicago Bridge & Iron Works. See Colored Advertising Section.

A Booklet Describing Counters for rate setting and production work. See page 72. The Veeder Mfg. Co.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg Co. See page 105.

Waste Cans for heavy duty industrial use. See page 58. The Witt Cornice Company.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 40.

Seventeen Degrees of Black and three copying leads are described on page 114. American Lead Pencil Company

Eye Protection at Its Best. See page 67. Willson Goggles Inc.

Canvas Cushion Truck Wheels that outlast rubber ten to one. See page 59. Divine Brothers Company.

Chipping Boxes that build good will. See page 69. The Hinde & Dauch Paper Company.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co. Page 80.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 63. Standard Pressed Steel Company.

Information and Specifications on Agitator Drives. See page 105. New England Tank & Tower Company.

The Latest Catalog describing Automatic Adjustable Steel Stools for office, shop and factory. See page 80. Vitex Mfg. Co.

A Worldwide Service in mechanical rubber goods for every industrial need. See Colored Advertising Section. United States Rubber Company.

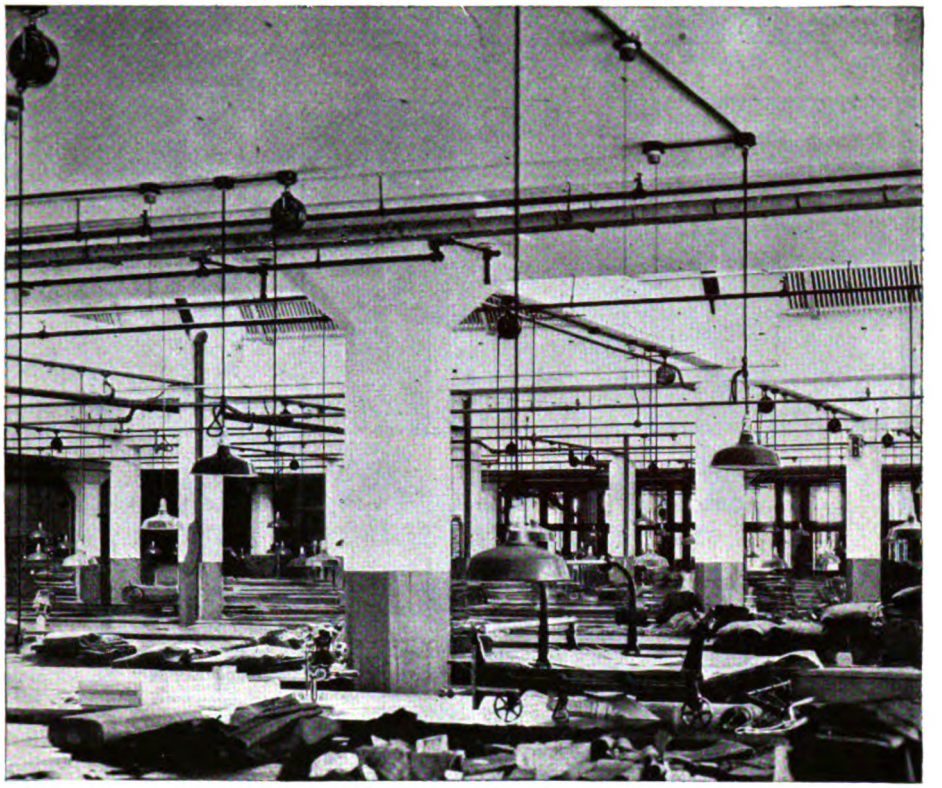
A Booklet Describing Temperature Control is offered by Taylor Instrument Companies. See Colored Advertising Section.

Catalog No. 9 describes an industrial thermometer that can be read at a distance. See Colored Advertising Section. The Moto Meter Company, Inc.

An Economical Means of Cleaning Parts and Products shown on Colored Advertising Section. Oakite Product Inc.

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Reelites at work with portable electric cloth-cutters in tailoring plant of Keller, Heumann & Thompson, Rochester, N. Y.

These cloth-cutters work faster because Reelite *helps* them

Portable electric cutters must move freely, swiftly and with no interference from lengths of cord coiled up in their path or dangling in their wake.

As in all cases where power must be supplied to moving machinery, Reelite solves this problem perfectly.

Whether the cord is to work like a window-shade roller, halting at just the right extension, or whether it is to constantly reel out and in with the continuous movement of a huge travelling crane, or merely a small cutting machine—there is a size and type of Reelite to do the job efficiently and economically.

Reelites always pay their cost in cord renewals and time saved. They'll do it for you. Let us send you leaflet 331-S describing all models. There is, of course, no obligation involved. Just drop us a line.

APPLETON ELECTRIC COMPANY

1716 *Wellington Avenue* · *Chicago, U. S. A.*

New York—150 Varick Street Los Angeles—340 Azusa Street



Reelite

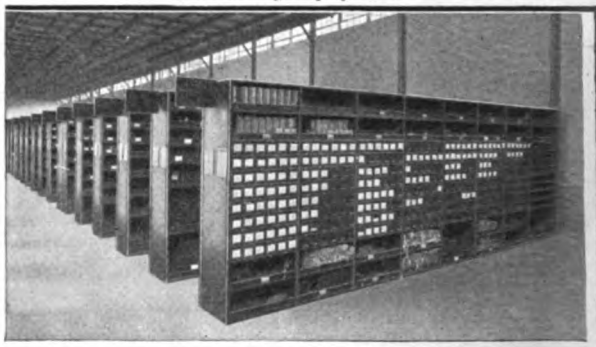
The Handy Light on a Reel

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Bulky, expensive-to-keep-up, fire hazardous, obsolete bins. → OR ← Orderly, efficient, easily controlled, steel storage equipment.





Your Storeroom-

THE STARTING POINT OF LOWER PRODUCTION COSTS

High production cost aids competition and is always a barrier to profitable selling. Excessive overhead cost in storage and production departments is frequently traced to wood storage equipment. Cost of floor space, time lost in finding stock and depreciation add to your overhead.

Steel shelving will lower storage costs and make stores control easier. Less floor space is required. There is no danger from fire. Adjustability provides for more stock in less space. Greater visibility of contents, easy location of materials and accurate stock control result from Durand Steel Shelving advantages.

Our engineering service includes layout of stock room and recommendation of standard materials to meet your needs, based on the successful storeroom practices of the world's leading industrials. Write us for catalog or for engineering service. There is no obligation.

NEW YORK
NEWARK
PHILADELPHIA

DURAND STEEL LOCKER CO. INC.

1539 First National Bank Building
Chicago, Illinois

PITTSBURGH
DETROIT
LOS ANGELES

Save These For Work a Machine Can't Do



Die Grinding With Haskins H-4 Equipment

Your Best Workmen Would Pick Haskins Equipments

Good workmen do not count machine costs in quite the same manner as do plant executives. First costs have no meaning to them. But after equipment is installed they can shortly tell you what it means in increased output and quality of work.

With a HASKINS Demonstration in your own plant your own men can quickly show you the many cost-cutting features of this, the highest grade, equipment for grinding, filing, scraping, metal pattern making, die sinking, buffing, etc.

HASKINS Equipments are handled by the Better Jobbers

R. G. HASKINS CO.

Portable Flexible Shaft Machinery

3457 Lake Street Chicago, Illinois

Branch Offices in Principal Cities

AN IRON THAT RESISTS RUST-ACID-CORROSION



So much so, in fact, that it is used for nitric acid containers, turbine buckets, blades, coal mine equipment, marine hardware, and sporting goods.

DELHI TOUGH IRON

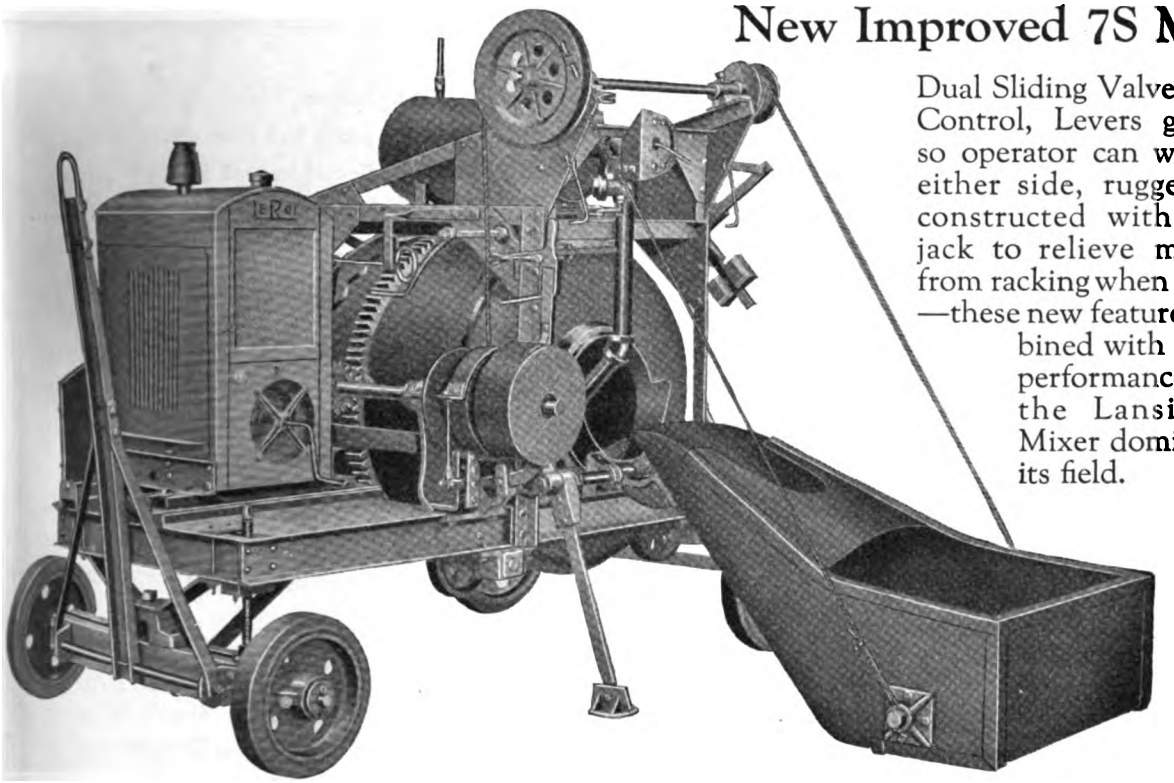
is worthy of your investigation.

May we send you the facts?

LUDLUM SPECIAL STEELS LUDLUM STEEL COMPANY — STEELS SPECIAL PURPOSES WATERVLIET-N.Y.-U.S.A.

...oducts not advertised in this issue write Industry Illustrated

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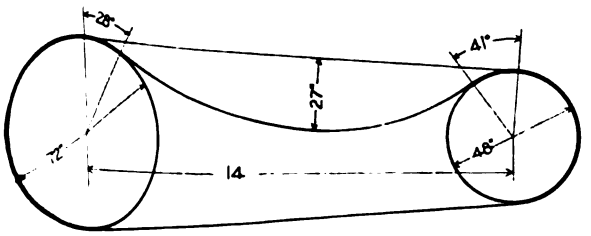
New Improved 7S Mixer

Dual Sliding Valve Water Control, Levers grouped so operator can work on either side, rugged axle constructed with frame jack to relieve machine from racking when loading —these new features, combined with faithful performance, make the Lansing 7S Mixer dominant in its field.

LANSING-COMPANY

Factory: Lansing, Michigan. *Branches:* Boston Kansas City Minneapolis Chicago New York Philadelphia Cincinnati

"Tighten It"—NOT the answer to a slipping belt



Practical men find it more often in the increased arc of contact made possible by a slack belt, treated with that 30-year-dependable

Cling-Surface

You may use it with every confidence of prolonging belt life; at the same time of saving slippage and thus power costs, of saving bearing and lubrication troubles, and of saving shaft and machine strain.

Not a "discovery", but a scientific treatment developed from the tests of engineer and practical authorities on power transmission.

Sold on Approval

Try Cling-Surface 60 days under our warranty that its benefits are effective under your peculiar belt conditions, or you need not pay. Order 3 or 6 gals. *on trial*—tell whether warm, dry, clean or the contrary in your plant. Begin saving money, trouble and belts by ordering today.

Clip name and address as reminder to write

CLING-SURFACE CO.
1056 Niagara St. Buffalo, N. Y.



Complete Stocks Everywhere

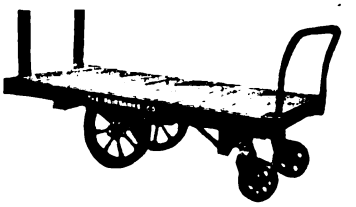
No matter where you are located, there is a mill supply dealer within a few miles who can deliver from stock any one of 26 different models.

Just keep in mind in ordering factory trucks that *the best will always be made of wood—steel-bound*, and that "best" can be delivered at your door the same day you telephone.

Order by number from our truck catalog.

THE FAIRBANKS COMPANY
Broome and Lafayette Sts., New York, N. Y.

Fairbanks



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A

Advance Car Mover Co. 53
Allen Mfg. Co. 78
American Asphalt Paint Co. 49
American Blower Co. .....
(See Colored Advertising Section)
American Fixture Co. 78
American Lead Pencil Co. 114
American Pulley Co. 74
American Saw & Mfg. Co. 64
Appleton Electric Co. 115
Arguto Oilless Bearing Co. 36
Armstrong Bros. Tool Co. 40
Atlas-Chicago Co. .....
(See Colored Advertising Section)

B

Baker-Raulang Co. (formerly Baker R. & L. Co.) 111
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(See Colored Advertising Section)

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WALLS

that weather even a deluge!

YOU want your walls to do three things: — stand up permanently, shut out moisture, hold their beauty through the years.

When brick, limestone or sandstone walls are unprotected, they won't satisfy these desires. The elements will wear them down. The moisture will creep through them. They will become streaked and discolored.

Walls, protected by Hydrocide Colorless Waterproofing, won't have any of these faults.

Simply apply Hydrocide Colorless to the exterior. This great preservative penetrates the brick or stone and makes it water-repellent. It completely shuts out the elements and keeps the interior dry through driving rains.

Hydrocide Colorless not only protects your walls against moisture; it prevents them from becoming discolored and preserves the natural beauty of the brick and stone work.

You can safely specify Hydrocide Colorless for application in cold weather. Since it contains no paraffin, it will never run in hot weather. Walls on which it is used can be easily painted. It will not collect dust, and when applied is absolutely invisible.

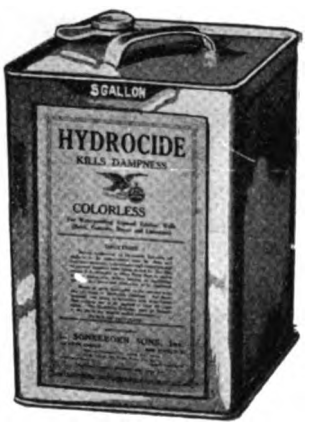
Many leading architects are adding to the life and beauty of their buildings by specifying this permanent waterproofing liquid.

Let us tell you about the famous structures that have been waterproofed with Hydrocide Colorless. Send coupon below for literature and free samples.

Hydrocide

Colorless Waterproofing

Protects Brick and Stone Walls from the Elements



L. SONNEBORN SONS, Inc.

114 Fifth Avenue, New York

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LIGNOPHOL
Wood Floor Preserver and Hardener

CEMCOAT
Washable Enamel Paint

LAPIDOLITH
Hardens Cement Floors

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COUPON

L. SONNEBORN SONS, Inc., 114 Fifth Ave., New York

Please send me, without obligation, demonstration samples and literature on:—Lapidolith ...; Lignophol ...; Cemcoat ...; Hydrocide Colorless ...; (Check products that interest you.)

Name .....

Address .....

Company .....

Position .....

I. I. 2

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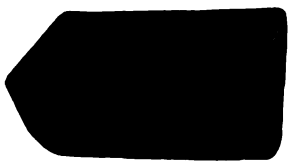
Link-Belt Bucket Elevators

All Types and Sizes

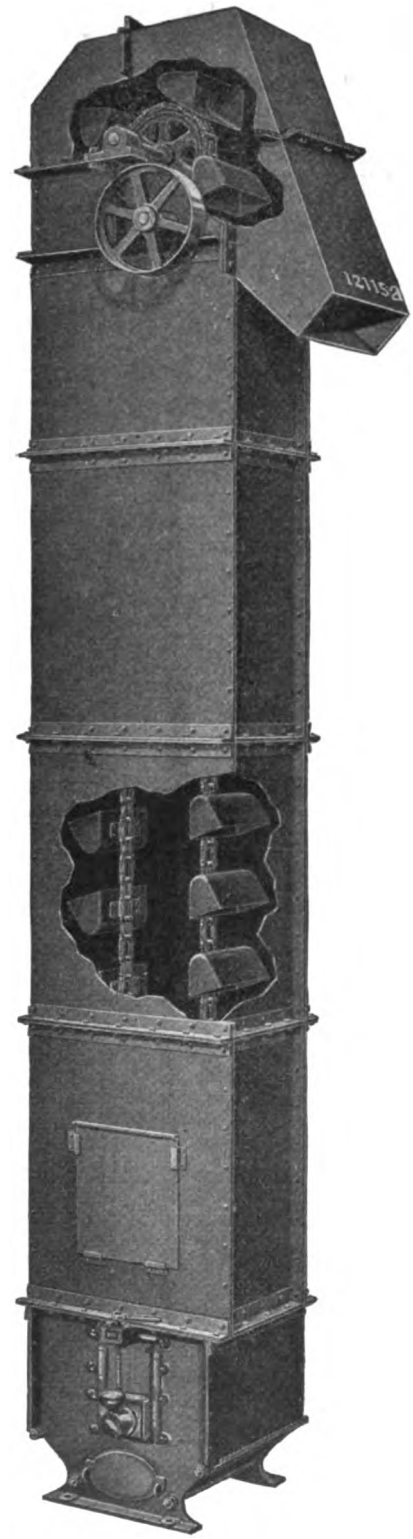
Built to the high Standard which characterizes all Link-Belt Products



Sprocket and Traction Wheels. Made to fit the chain. Furnished in the >FLINT-RIM< or gray iron. Stocks of popular sizes.



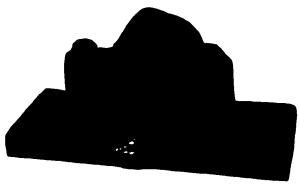
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Tell us the kind of Material you wish to handle and full particulars

Send for Catalogs



Bearings—Light and heavy with approved types of lubrication, oil well, grease cup, ring oiling, or collar oiling.



>HEX-TOP< Grease Cup of Malleable iron. Rugged—grease tight and easily turned by hand or wrench. Malleable iron safety collars—durable and light in weight.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying and Power Transmission Chains and Machinery.

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New York, 2676 Woolworth Bldg.
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2686

LINK-BELT

dvertised in this issue write Industry Illustrated

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GOHEEN
PAINT ENGINEERS

TESTED PROTECTIVE COATINGS for IRON and STEEL

Goheen "Paint Engineers" are trained paint experts who have gained their knowledge and experience in acting as "Paint Engineers" to the largest Industrials, Public Utilities and Railroads since 1888.

Their research facilities in the field, their completely equipped testing laboratories, together with their scientific methods of chemically combining the oils and pigments used in their protective coatings, take them out of the field of ordinary paint manufacturers.

This is the age of specialization. If you were going to build a machine to manufacture a certain article, you would call in a Mechanical Engineer. The engineer would first inform himself of what the machine was supposed to do, then he would submit his specifications.

Our "Paint Engineers" design each Goheen product to fit the particular problem of the industry for which it is intended.

The result is a protective coating that will efficiently and economically protect the surface to which it is applied.

Our staff of "Paint Engineers" is always at your disposal for the solving of the preservative problems to meet the individual case.

CARBONIZING COATING FOR IRON and STEEL

All structural steel work exterior or interior to secure long time protection needs "Carbonizing Coating." For structural steel, bridges and all steel surfaces requiring an inhibitive and protective coating.

Chemically Combined HIGHWAY RED PURE PASTE Red Lead Paint

A priming coat giving results not obtainable from hand mixed Red Lead and Oil. For priming all Iron and Steel surfaces.

Galvanum

Will adhere to galvanized iron without any preliminary treatment whatsoever. For Industrial Buildings, Warehouses, Sheds and all Galvanized Iron Surfaces.

THERMOKOTE A GOHEEN PRODUCT A PAINT FOR ALL HOT SURFACES AND STACKS

Withstands high heat and at the same time protects the metal against rust and corrosion. For smoke stacks, boiler fronts and all similar hot surfaces.

GOHEEN CORPORATION of N. J.

Paint Engineers Since 1888

GOHEEN CORPORATION PAINT ENGINEERS SINCE 1888

NEWARK, N. J.

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EILERT PRINTING COMPANY, INC. 518-526 W. 39TH ST., NEW YORK



WE X-RAYED A SHEPARD HOIST SO YOU COULD SEE

WITHIN those tightly sealed metal housings of a Shepard Electric Hoist is an orderly arranged, balanced mechanism, completely protected from dirt, dust, dampness, fumes and varying atmospheric conditions.

An electric hoist built like a machine tool, with all gears and pinions machine cut from solid steel blanks, and every part finished to limits of 1/1000 of an inch or closer.

The electric brake, mechanical brake, gearing, winding drum, motor are all in line and provide permanent alignment so essential to dependable operation.

All gears drive at two points diametrically opposite, thus dividing the work among double the number of gear teeth which would be in contact by the usual arrangement. The stresses are, therefore, perfectly balanced and there is no pressure imposed upon the shaft bearings.

Thorough, automatic lubrication is assured by the oil bath and ring oiler method.

All parts are built on the unit system, and each is separately accessible without disturbing any other unit. When gear case bonnet is removed, every running part is free and can be lifted out with the hands without removing a single bolt, screw, pin, key, or other kindred device. Replacing the bonnet secures all parts ready for operation.

Shepard Electric Hoists predominate in the iron and steel and other industries—and the reason is easily understood—a design and construction with one thought in mind: consistent day in, day out performance.

SHEPARD

ELECTRIC CRANES & HOISTS

SHEPARD ELECT[illegible]E & HOIST CO., 420 Schuyler Avenue, Montour Falls, N. Y.

Branches in Principal Cities

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rch 15, 1927

B. & O. R. R.

25 Cents

Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

Putting Idle Dollars to Work

In practically every industrial plant there is usually an accumulation of obsolete stock parts and surplus materials. This represents invested capital which might be better utilized elsewhere.

How one manufacturer set about to prevent such a condition in his plant is explained in an article on page 7, of this issue.

When analyzed the problem resolves itself into one of production and purchase control. The beauty of the suggested solution lies in its simplicity.



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IG ENGINEERING MAGAZINE CO., 381 Fourth Ave., New York

BONNEY
*CV Chrome Vanadium
WRENCHES



This is the Engineer's Wrench

Tremendous strength
Light Weight
"Pear shape" jaws for close corners
Nickel finish with polished jaws

*CV is a Bonney trademark registered in the U.S. Patent Office.
Chrome Vanadium registered August 11, 1925.

This is the No. 25 Set

6 Bonney *CV Chrome Vanadium Double End Engineer's Wrenches—different size openings at each end.

This set takes care of 21 different size nuts and bolts from 1/4" U. S. Standard to 3/4" Hex Cap Screws.

Complete as illustrated

$7.85

Attractive discounts to dealers. Special price to mechanics.

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

BONNEY WRENCHES
Chrome-"CV"-Vanadium
REG. U.S. PAT. OFF.

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GOHEEN

PAINT ENGINEERS

Oxidized Carbon Cement

R. No. 5 Paint

USE IT ON STEEL AND ALL OTHER SURFACES SUBJECTED TO ALKALI, ACID FUMES AND GASES

Outstandingly the Greatest Protective Coating Ever Made

Will stand up under severe conditions, such as 20% solution of Caustic Soda and Soda Ash. Also withstands the action of Sulphuric Acid, Hydrochloric Acid and other commercial acids.

Order a trial agitator drum today, and forget your paint worries.

Paint Engineering Service

Goheen "Paint Engineers" are trained paint experts who have gained their knowledge and experience in acting as "Paint Engineers" to the largest Industrials, Public Utilities and Railroads since 1888.

All these thirty-nine years of experience are at your disposal for the solving of the preservative problems to meet the individual case.

GOHEEN CORPORATION OF N. J.

Newark, N. J.

Paint Engineers Since 1888

A Standard Goheen Paint for Every Type of Surface and Use

Galvanum — Carbonizing Coating for Iron and Steel — Chemically Combined Highway Red Red Lead Paint — Thermokote A Goheen Product A Paint for All Hot Surfaces and Stacks — Goheen's Mill White Trade Mark

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EILERT PRINTING COMPANY, INC.
518-526 W. 39TH ST., NEW YORK



Valuable Electric Hoist information for *you*—

another large edition

WIDE demand for useful and authoritative information about electric hoists and their application necessitated the printing of another large edition of the Shepard Floor Operated Electric Hoist Book—now ready for distribution.

Engineers and executives—prospective buyers of electric hoists—want the kind of specific information which this book gives.

Installation views of the many types of Shepard Hoists are included together with a description of how each particular type of machine is precisely suited to the application for which it is recommended.

This book suggests many ways of saving money in lifting and moving loads of every description.

It describes Shepard design: the smooth running Balanced Drive; the ever permanent alignment; the unit construction; the double safety provided by mechanical and electric brakes; the thorough lubrication which the oil bath method assures; the complete enclosure of vital parts affording protection from dirt, dust, dampness, fumes; the electric motor specially designed for electric hoist service; and accessibility of all parts.

You will want to know why Shepards are the most widely used electric hoists in America—and this book tells you.

Write for your copy

Requesting a copy of this Hoist Book places you under no obligation. Write for your copy today.

SHEPARD ELECTRIC CRANE & HOIST CO.,
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities

Largest Manufacturer of Electric Cranes and Hoists in America

REG. U.S. PAT. OFF.

SHEPARD
ELECTRIC CRANES & HOISTS

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ACME QUALITY—another user



Left: A battery of Logan Pusher Bar Elevators carries empty Acme cans to filling machines. Note how, in two of the three operations, Logan Conveyors lighten the work and enable girls easily to replace costly manpower.

Top right: Logan Gravity Rollers make the filling process a continuous, efficient operation, then pass the filled cases to a Logan Slat Conveyor which automatically assorts the cases by size and sends them, via Logan Gravity Rollers to (*bottom right*) the nailing machine. A switch section permits one nailing machine to serve three lines of gravity rollers.

A DOLLAR SAVED is a dollar earned! Paints or conveyors, the primary purpose is the same —*conservation*. Little wonder, therefore, that the makers of well-known Acme Quality Paints realize the importance of cutting out needless wastes of time, labor and money in manufacture and handling . . . In the face of keenest competition, their system of Logan Conveyors is helping the Acme White Lead & Color Works to maintain a favorable price schedule without compromise of either product or profit . . . Let Logan Conveyors do the same for you and put the difference into earnings. Write today for *your* copy of "Seven Economies of Logan Conveyors"—it will entail no obligations.



PAINTS or paper, tungsten lamps or tools—no product is too large, too small or too "different" to be handled more safely and more economically by Logan Conveyors. Successfully used in practically every branch of industry. It will pay you to get full information on the various economies of Logan Conveyors adapted to *your* needs.

Logan Co.
(Formerly THE DOW CO.)
LOUISVILLE, KY.

Offices in Principal Cities

Logan Conveyors
LOUISVILLE

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What Makes Burmaline Such A GOOD Transmission Belt?

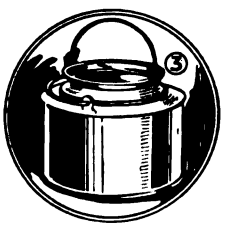
The patented method of manufacture and these quality products from which it is manufactured.



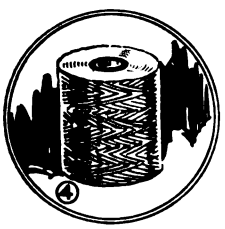
Solid Woven Base—used as a foundation upon which the layers are built up—is of long wearing construction and gives the belting the desired stamina.



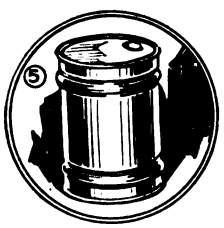
Cotton Duck. The layers—which are built up on the base—are of a selected grade of cotton duck of the highest quality and possessing great strength.



Hide Glue. The friction used to bind the layers together is an exceptional grade of hide glue. This product has been known to stay in a state of preservation for thirty years as applied to transmission belts, so by its use we are assured of great durability.



Cotton Thread. Burmaline Belting is edge sewed with strong cotton thread as a reinforcement.



Dressing. Burmaline Belting is treated with a specially prepared scientific compound worked out in our own laboratory.

The result:

The Toughest Belt Made. Make Us Prove It.

Great tensile strength. Will Not Pull Crooked. Withstands heat, oil, dust and acid fumes. Adaptable to over 95% of all drives. Made in only one grade—in various standard thicknesses of SINGLE, LIGHT DOUBLE AND DOUBLE. Continuous lengths with NO LAPS OR SEAMS. Excellent Suction On Pulleys. Takes any kind of belt lacing. Many other cost saving features.

Ask your jobber's salesman about it. Write for "How, When and Where to Use Burmaline Belting."

BURRELL BELTING COMPANY

Manufacturers of Burmaline Belting—Alfalfa Belting—Ebony Transmission and Conveyor Belting—Universal Belt Oil and E-Z Grip Transmission Lining for Ford Cars and Trucks

416 South Hermitage Ave., CHICAGO, ILL.



Keeping Abreast of Industrial Development

TODAY'S editorials are the established practices of tomorrow, so swift is the progress in industry.

Every month articles appear in INDUSTRY ILLUSTRATED which show the way to newer and better methods in production, in handling, in power generation and transmission and in other departments of modern industry.

These articles help the reader to lower the manufacturing costs in his plant.

The equipment and machinery that effect these economies are presented to you in the advertising pages, and the ready reference "Where to Buy" such equipment will be found on pages 110, 112, 114, 116.

Harvey Conover, Jr.
Business Manager.

Industry Illustrated

Published Monthly by

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Editorial and Executive Offices:
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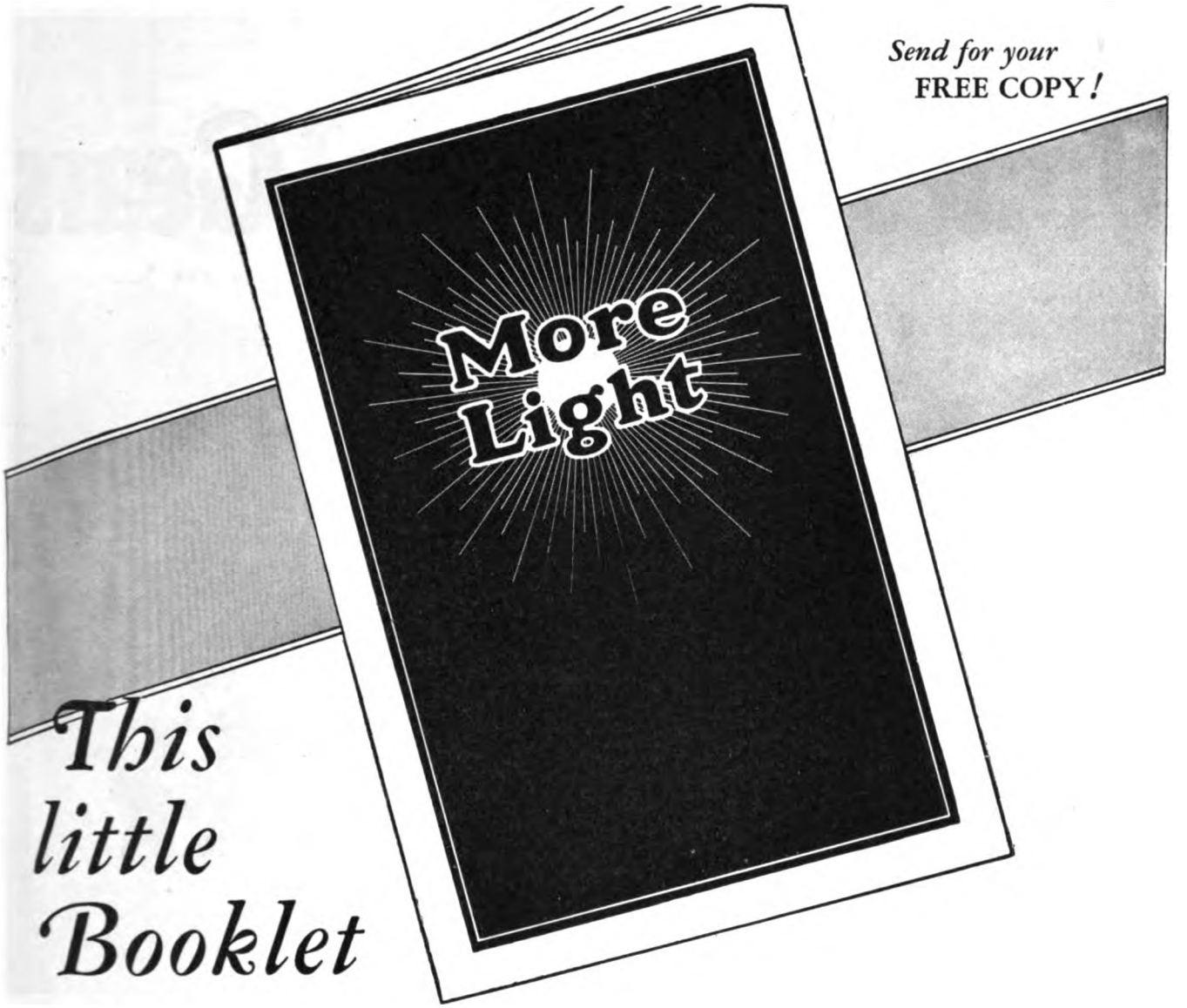
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Secretary

Western Office: 307 No. Michigan Ave., Chicago, Ill.

Pacific Coast: 155 Montgomery St., San Francisco, Cal.

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Send for your FREE COPY!

This little Booklet

has saved thousands of dollars in interior painting . . .

MANY plant managers are cynical about the claims made for interior paints. No wonder—in view of their costly experiences with paints that yellow—paints that flake—paints that get dirty and can't be washed!

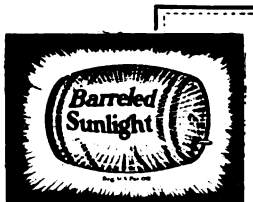
It is difficult to prove in a short advertisement that any paint overcomes all these objections and yet actually *costs less* when applied.

But we believe that our booklet, shown above, contains facts and honest testimony of actual users, which do prove that Barreled Sunlight resists yellowing, will not flake, washes like tile, and can be applied at the lowest cost per square foot covered.

The manufacturers of Barreled Sunlight have been specialists in the industrial white paint business for over 20 years—long enough to know most of the problems and also long enough, if thousands of satisfied customers mean anything, to solve those problems pretty completely.

The coupon will bring you a copy of the booklet and a sample panel painted with Barreled Sunlight.

U. S. Gutta Percha Paint Co., 5 Dudley Street, Providence, R. I. Branches: New York—Chicago—San Francisco. Distributors in all principal cities.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

Please send us your booklet "More Light," and a sample panel painted with Barreled Sunlight.

Name .....

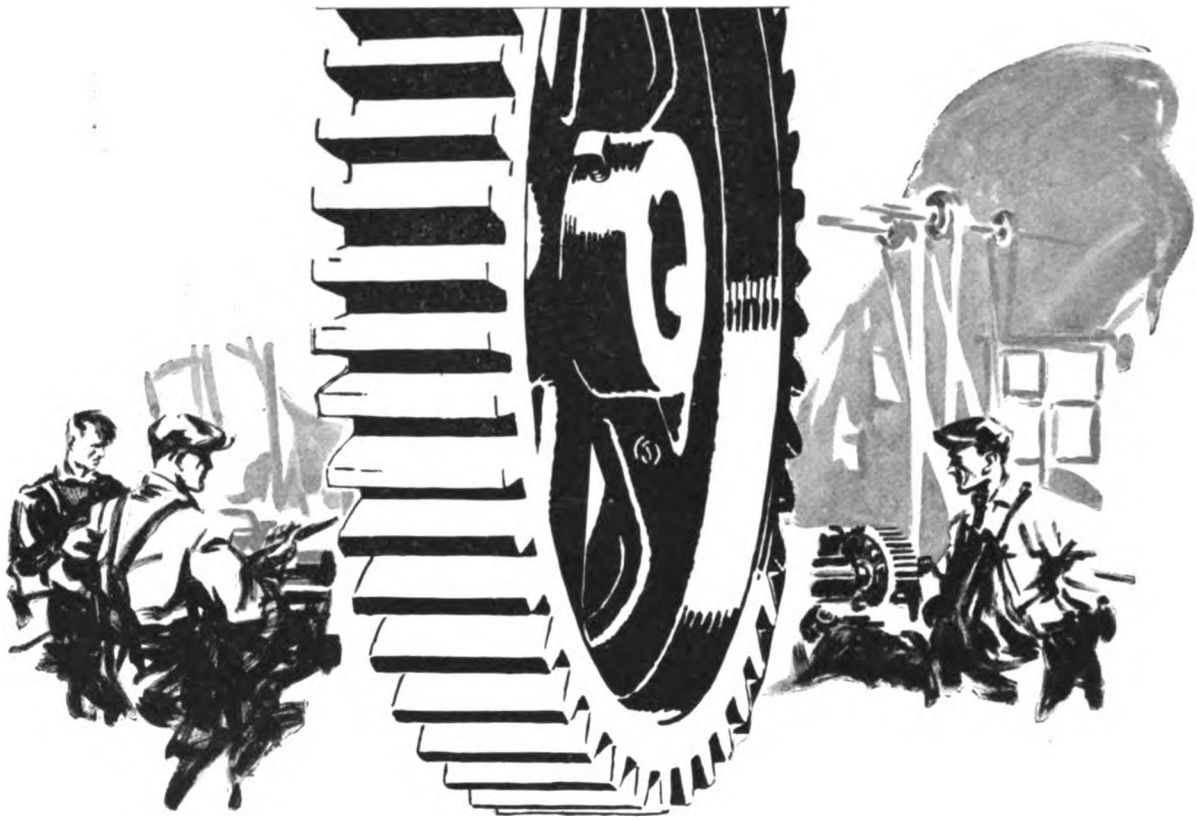
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Jones Industrial Gears



DO you know the service we can give you in gears? If you need cut spur gears eight feet in diameter, for instance, or if you require gears so small you can slip them in your pocket, you can get them from us. You can also get cut worm, bevel and mitre gears. You can get gears of steel, cast iron, rawhide or bakelite.

Whenever you need gears, get an estimate from us. You will find in quality, prices, shipping dates and other factors that constitute dependable service, that Jones service is constantly reliable.

For your convenience we maintain branch sales and engineering offices in principal cities. Write or telephone our nearest office for a representative whenever you need gears, speed reducers, flexible couplings, pulleys, or other power transmission products. You will find complete information in our General Catalogue Number 30. If you do not have a copy of this catalogue please write the home office for one.

W. A. Jones Foundry & Machine Company

Main Offices and Works: 4412 West Roosevelt Road, Chicago

Branch Sales and Engineering Offices:

New York Cleveland Milwaukee Pittsburgh Buffalo Detroit Birmingham St. Louis Cincinnati

Pacific Coast Representatives:

The King-Knight Company, San Francisco, Los Angeles, Seattle



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Industry Illustrated

Modern Methods and Equipment

For Mill, Shop & Factory

JOHN R. DUNLAP Editor

W THOMSON LEES Associate Editor WILLIAM W. BAXTER Associate Editor ADOLF SCHILDKRAUT Art Director

Contents—March 15, 1927

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M. J. Bowne

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Cutting Tools Easily Sharpened in Modern Grinding Machines 10

Frederick B. Heitkamp

Here are shown pictorially approved methods and equipment used in modern manufacturing plants for conditioning all manner of milling cutters.

Surface Wiring and Its Relation to the Demand for Better Lighting 13

E. I. Bell

For the plant executive, the production department and the maintenance man this article contains much of interest as to the use and possibilities of surface wiring as an aid in increasing production and cutting costs.

An Interesting Application of Modern Equipment 16

Illustration

Within recent years railroads have become extensive users of modern equipment. This illustration shows how one road uses an electric truck fitted with a crane for performing what was formerly a difficult task.

Air Compressor Lubrication a Factor in Industrial Production 17

Allen F. Brewer

With the extensive use of air compressors in industrial manufacturing it is essential that their lubrication be thoroughly understood. For this reason the author describes different lubricating systems and the properties of different lubricating oils.

Materials Handling Equipment in Miscellaneous Industries 20

Edward J. Tournier

Here the author describes and illustrates the applications and uses of a diversified line of materials handling and conveying equipment.

The New East River Power Station of The New York Edison Company 23

A detailed description of a novel and thoroughly modern large power generating station.

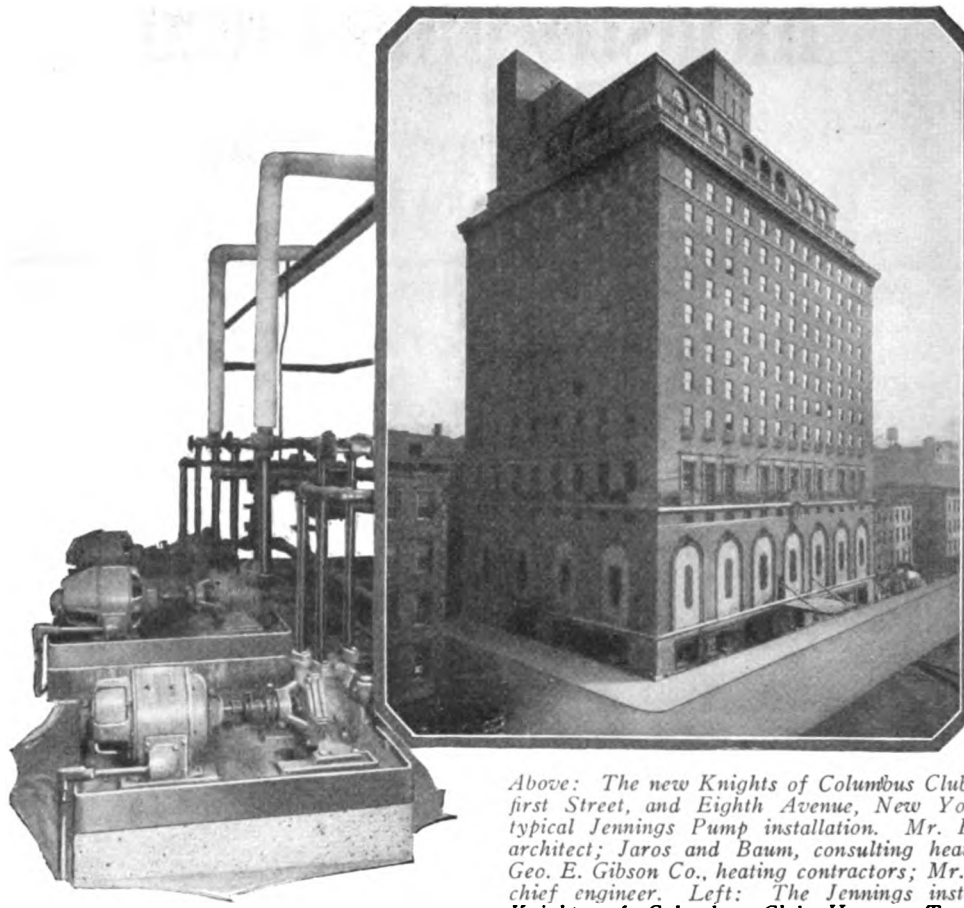
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Above: The new Knights of Columbus Club House, Fifty-first Street, and Eighth Avenue, New York, N. Y. A typical Jennings Pump installation. Mr. E. F. Fanning, architect; Jaros and Baum, consulting heating engineers; Geo. E. Gibson Co., heating contractors; Mr. James Holton, chief engineer. Left: The Jennings installation at the Knights of Columbus Club House. Two motor-driven units, each capable of handling 40,000 sq. ft. equivalent direct radiation; and a third unit for 26,000 sq. ft. Discharge against 20 lbs. per sq. in. pressure.

Judge Jennings Pumps by the many buildings that use them

"The proof of the pudding is in the eating." An old adage. But it still holds true. For heating pumps, as for everything else.

Jennings Heating Pumps are used everywhere. For office buildings, apartment houses, factories, schools, and similar large buildings. There are over 17,000 installations. And the number is still growing.

A significant tribute to the excellence of Jennings Heating Pumps.

If you are not familiar with Jennings Pumps and the efficient, economical and dependable way in which they remove the condensation and air from the return line vacuum steam heating system, write for Bulletin 37. It is free for the asking, and contains full information.

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Controlling Purchases and Production to Eliminate Surplus Materials

A Definite Plan for Preventing an Accumulation of Obsolete Parts

By M. J. Bowne

Works Accountant, De Laval Separator Co.

DESPITE the fact that industrial engineers and accountants are continually having controversy regarding interest as an element of cost, the modern manager realizes that the cost of invested capital is rapidly becoming an important factor in production. The truth that inventories represent more than 50 per cent. of invested capital in many lines of industry indicates that here is a fertile field for cutting costs by reducing materials and finished goods to a minimum.

The expense of carrying a large inventory is insidious, —it cannot be seen, it doesn't make a noise, nor does it make itself conspicuous by loafing and getting into trouble. Here is just as truly a cost as any other element entering into manufacture. Without any question, improper inventories have occasioned many firms to wind up their fiscal year with red instead of black figures in their profit and loss statements.

Purchasing Agents, production managers, and accountants, who have had difficulty in controlling purchases of materials, or an accumulation of surplus and partially obsolete parts, will find in the accompanying article a definite plan which has practically eliminated these conditions in one large manufacturing plant. With the article is a sample of the form used and an explanation which should make the scheme easily applicable to other industries.—The Editors.

Much has been written and considerable accomplished in American industries toward reducing inventories. Hand-to-mouth buying has been elevated from a position associated with the penurious



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housewife to an accepted principle of industrial management. While this work has been carried on, we have discovered the possibility of overlooking a point in this connection which is not so spectacular.

In a business where the product is constantly changing because of improvements in design, methods of manufacture and demand of the trade, there are bound to be items of stock and parts constantly becoming obsolete or slow moving. Our problem was to keep our inventories, with as little loss as possible, free from such barnacles.

Our plant is large and many ways may be found of using surplus stock without scrapping it or selling it at a sacrifice. Our stock records are so housed in filing equipment that they permit the free use of signals—special markers are used to indicate overstocked items. These remain until items in question are disposed of.

In addition to this check, stock record clerks are required to use signals on overstocked parts, or materials which have escaped the scrutiny of the surplus stock clerks.

All notices covering changes in design or specifications, discontinued models, etc., must pass through the surplus stock clerk, further insuring us against carrying dead wood on our books. As a result of the frequent checks which we have placed on our surplus stock, it became imperative that a regular official method be devised to intelligently dispose of the many surplus and dead stock items that appeared.

STOCK DISPOSITION REPORT

Location — 4H — M

Report No. 2126

Date Nov. 1, 1926

1 SYMBOL: SF-8312	2 DESCRIPTION: Top-Bowl Complete
3 MACHINES USED ON: 202-203	7 ORDER POINTS: 1-?
4 SUPERSEDED BY: 8727	8 USAGE 1923: 0; 1924: 10; 1925: 103; 1926: 0
5 COMPONENT PARTS AFFECTED: 8202 Top-Bowl; 8314 Wing-Short-Bowl Top; 8313 Wing-Long-Bowl Top; 6569 Nut-Coupling-Bowl	9 STOCK: 11
6 ASSEMBLIES AFFECTED	10 UNIT VALUE: $15.50; 11 TOTAL VALUE: $170.50

		Stk.	Order Points	1923	1924	1925	1926
SF-8300	Bowl	1	0-0	-	-	52	2
SF-8387	"	2	2-?	-	1	32	0

ROUTING and RECOMMENDATIONS

KEEP IN REGULAR STOCK	SUPERSEDED STOCK O.P. 0-? FULL VALUE	DEAD STOCK O.P. 1-? NO VALUE	OBSOLETE STOCK O.P. 0-0 NO VALUE	SCRAP	SELL	REMARKS ON DISPOSITION	SIGNED
							Stores Auditor M. H. D.
						These can be made into 8727 Tops by removing Wings soldering in new ones and turning the Wings to new size	Drawing Dept. M. L. J.
							Salvage Dept. R. L.
							Chief Storekeeper G. W. M.
						Rework as above.	Asst. Supt. W.
							Supt. G

PLANNING DEPT.		COST DEPT.	
ISSUES	✓	MASTER FILE	✓
CREDITS		INSPECTOR'S RECORDS	✓
CHANGE IN O. P. SLIPS	✓	ACCOUNTING RECORDS	
BIN LABELS	✓		
ORDER ISSUE			
INSTRUCTIONS			

SIGNED G. PLANNING DEPT.

SIGNED W. COST DEPT.

A standard form used to prevent production and accumulation of obsolete parts.

Full details concerning each item to be disposed of are ascertained from the stock records. The form utilized for this purpose is here illustrated.

So that all surplus stock might be disposed of to the best advantage, it was decided to call weekly meetings of those who were in close touch with the various conditions surrounding situations. The plant superintendent, assistant superintendent, and heads of the designing, stores, salvage and stock record departments formed the surplus stock committee and were called together. Each week about twenty-five items were reviewed and disposed of in the light of the information available, together with the judgment of the several members of the surplus stock committee. Where there were differences of opinion as to the best method

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of disposing of stock, the work's superintendent made the final decision.

After this plan was in operation for a year or so, we arrived at a point where it was no longer necessary to call a committee meeting each week. The elimination of surplus stock is now readily accomplished by routing the illustrated form to those interested, the committee being called together only when items of a special nature are under consideration.

The form, after spaces one to eleven are filled in by the surplus stock clerk, is circulated among the members of the committee to indicate their decision in respect to disposing of the item in question. This is done by checking one of the columns to the left under the heading Routing and Recommendations.

The columns marked Sell, Scrap, and Keep in Regular Stock need no explanation. The column headed Obsolete Stock, O. P., 0-0, No Value covers parts which are superseded by another part that is interchangeable. In such cases as this all parts are disposed of by scrapping or reworking them into usable units—the entire record is cancelled.

The column headed Dead Stock, O. P. 1-?, No Value, indicates stock for old models, where the usage is very low, but for which we may at some time wish to supply a replacement to a customer. Consequently we keep a small amount on hand but the value is written off the books.

O. P. signifies order points, for instance O.P., 1-?, would mean a minimum stock of one piece. When the stock reaches this point we question the advisability of reordering.

While this outline of how we eliminate surplus stock is largely descriptive of the methods used in the treatment of parts, the same general scheme is applicable to rough materials, supplies and tools.

The saving effected in interest, handling charges, space occupied, etc., we believe is conservatively set at 10 per cent. It does not require a very deep analysis to see the possibilities of an inventory composed of a variety of materials and finished products in a business which is confronted with numerous changes. The plan has been a profitable one for us, and no doubt if adopted in a similar manner in other plants will show an equal profit.

An Approach to the Contentious Question of "Hand-to-Mouth" Buying

IF, as Mr. Bowne says in the foregoing discussion, more than 50 per cent. of invested capital in many industries is represented in inventories, it would appear that accurate materials and production control should afford a fertile field for cutting costs, by reducing stocks and finished goods to a minimum.

Moreover, there is considerable actual out-of-pocket loss in interest on capital invested in inventories. Large stocks of materials occupy floor space which must be paid for unnecessarily in rent. Extra and often unnecessary records must be kept where there are accumulations of surplus materials or manufactured goods, entailing additional extra expense for clerical hire. In fact, the subject is of so much importance to industry that for years many schemes have been tried and many suggestions offered as to means of reducing inventories.

Today, many executives are studying and experimenting with the possibilities of reducing inventories by hand-to-mouth buying. Some contend that this now prevailing practice is of benefit in this respect, and is an aid to business in general. Others say the opposite.

One large manufacturer said in part recently in discussing this subject:

"Hand-to-mouth buying tends to prevent over production, which is one of the most serious conditions we have to contend with in industry, and, frankly, I really believe it cannot help but have a very stabilizing effect on business in general."

Still another manufacturer said, "Hand-to-mouth buying can be carried too far, just as an inventory can be allowed to become too bulky. I think restrictive buying, in other words, careful buying, so that inventories do not become too great, is profitable for the manufacturer, the distributor and the consumer. Unwise buying in too great quantities encourages the distributor to expand his stock and the manufacturer to expand his facilities and contracts for raw materials, with the result that he builds up a surplus."

To the contrary, another executive said: "In general, I think hand-to-mouth buying is bad for manufacturers because it causes them to carry larger inventories to promptly satisfy demands," while another man is of the opinion that the practice "causes waste of time through inadequate stocks; increased cost of handling because of small orders; and a tendency toward increasing manufacturing costs if goods are produced against orders."

In any event, there appears to be a wide divergence of opinions on the subject. For this reason, the columns of INDUSTRY ILLUSTRATED may be used for any open discussions offered. Purchasing agents are at sea as to how they should buy. Executives are at a loss as to how they should run their plants and whether further expansion is justified. Production men don't seem to be able to determine definitely how much to produce. Distributors are unable to decide on how much stock to carry and in fact the only person who seems to know exactly what to do is the consumer.

Hence, if any of our readers are sufficiently interested we will welcome any suggestions or discussions relating to hand-to-mouth buying or any other scheme or method that will in any manner aid industry at large in keeping inventories at a minimum and prevent accumulations of stock or obsolete products.—*The Editors.*

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Cutting Tools Easily Sharpened in Modern Grinding Machines

By Frederick B. Heitkamp

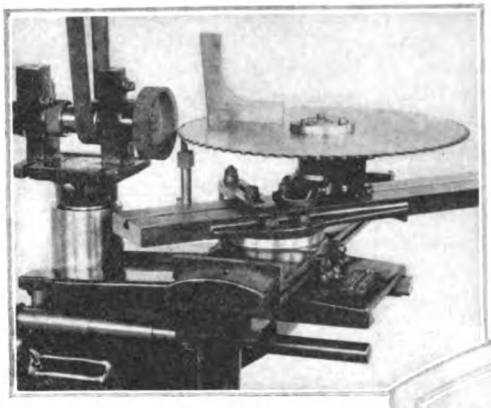


Fig. 1. Grinding clearance angle on teeth of large cut-off saw, using a special gage and a special clamp.

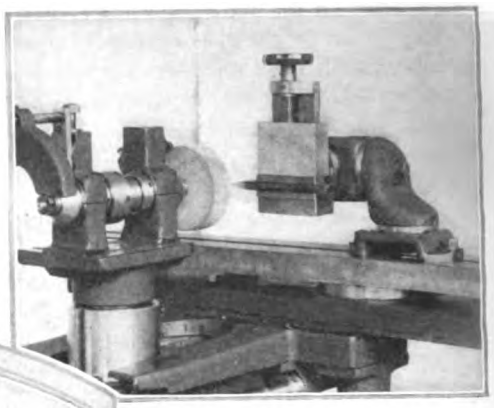


Fig. 3. Below — Sharpening curvex milling cutters is a simple task with the use of modern tool grinders.

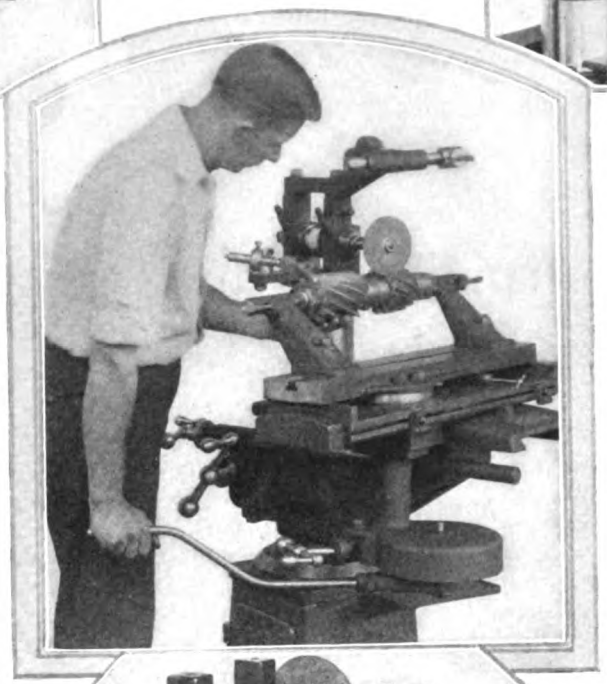


Fig. 2. Thread chasing tools must be accurately shaped to obtain good results. This is easily done in grinding machines.

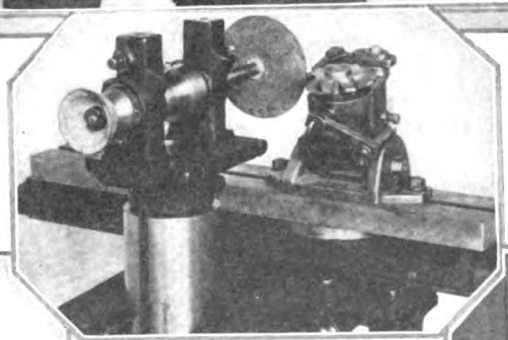


Fig. 5. Method and equipment used for grinding the 22½ deg. face of a 16-inch diameter inserted tooth face milling cutter in a modern tool grinding machine.

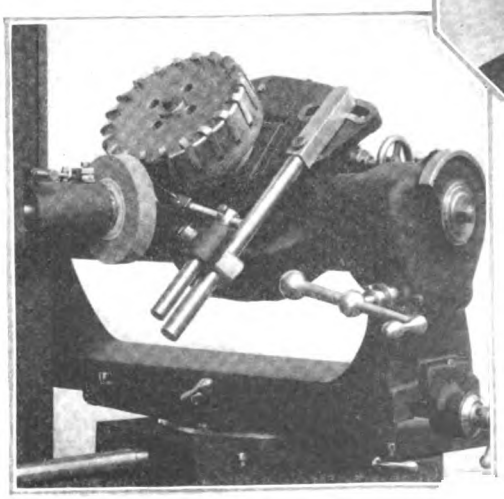


Fig. 4. Sharpening gear roughing cutters having alternate left and right side rake requires the special equipment shown above. In this case the tool grinder is a standard product, only the fixture being of special design.

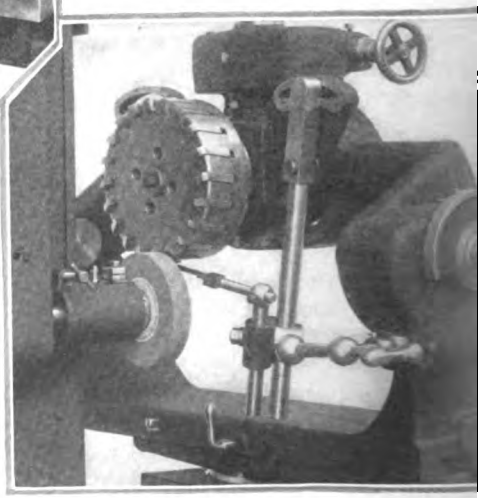


Fig. 6. Grinding the face of a 16-inch diameter inserted tooth face milling cutter in a modern tool grinding machine.

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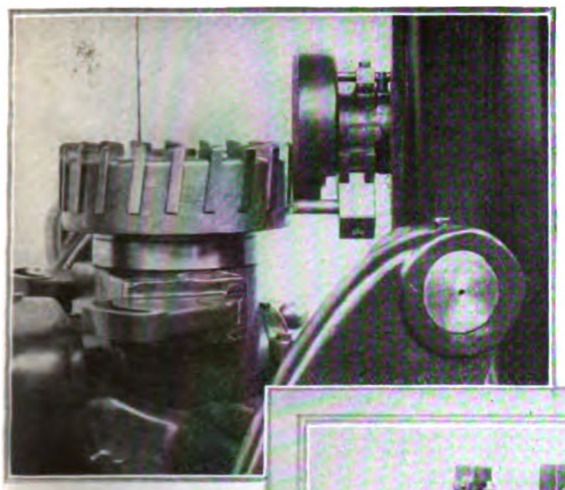


Fig. 7. Attachments used for grinding sides of face milling cutters in order to produce flat surface on the part being milled.

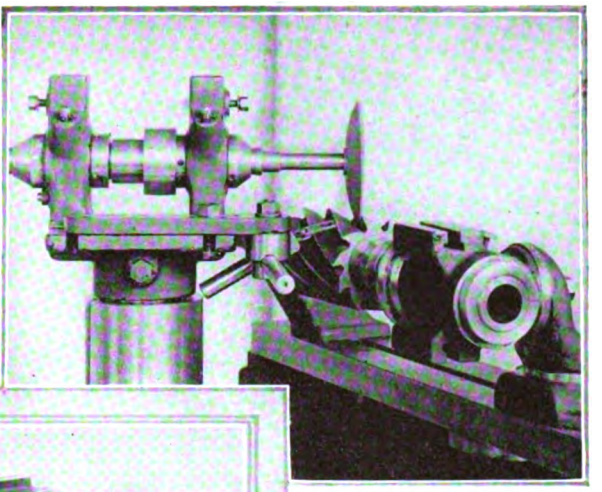


Fig. 8. Grinding rake into a spiral milling cutter which was originally made without rake, using special holding fixture.

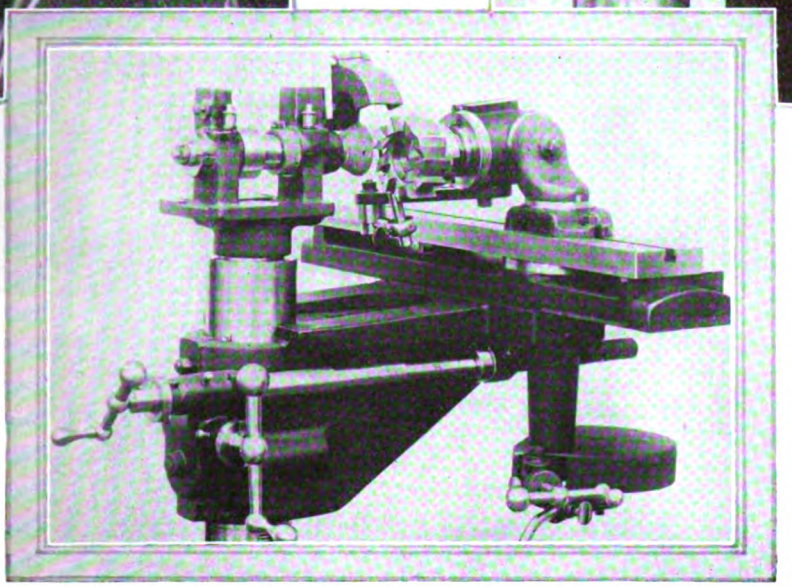


Fig. 9. To grind the face teeth of a shell end mill very little equipment is needed. Notice that in grinding the cutter is revolved about an arbor and that a stop is employed to hold each tooth in proper position.

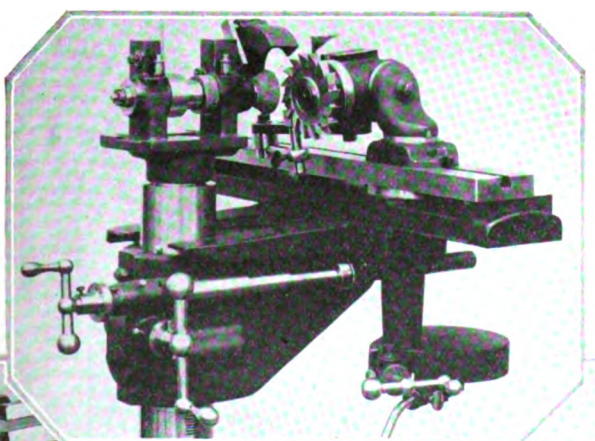


Fig. 11. An improved method for sharpening an angular cutter. Notice the special equipment for obtaining different angles.

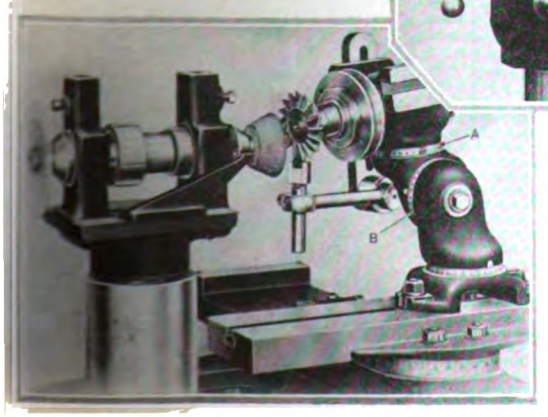
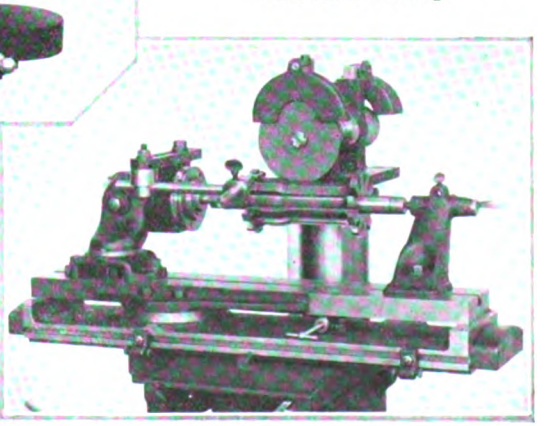


Fig. 10. Above—Grinding the side of the teeth of a side milling cutter. This operation and equipment is very similar to that shown in Fig. 9.

Fig. 12. In grinding the cutting edges of form mills the cutter is held between centers and a stop prevents the mill from turning.



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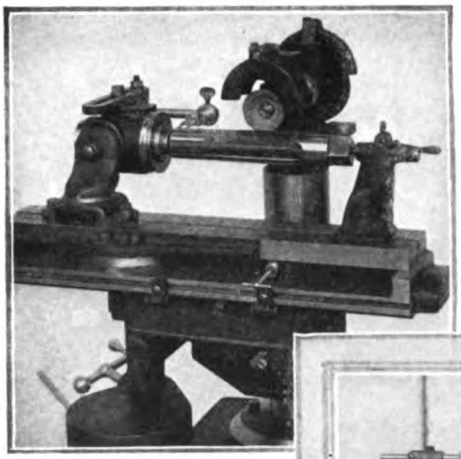
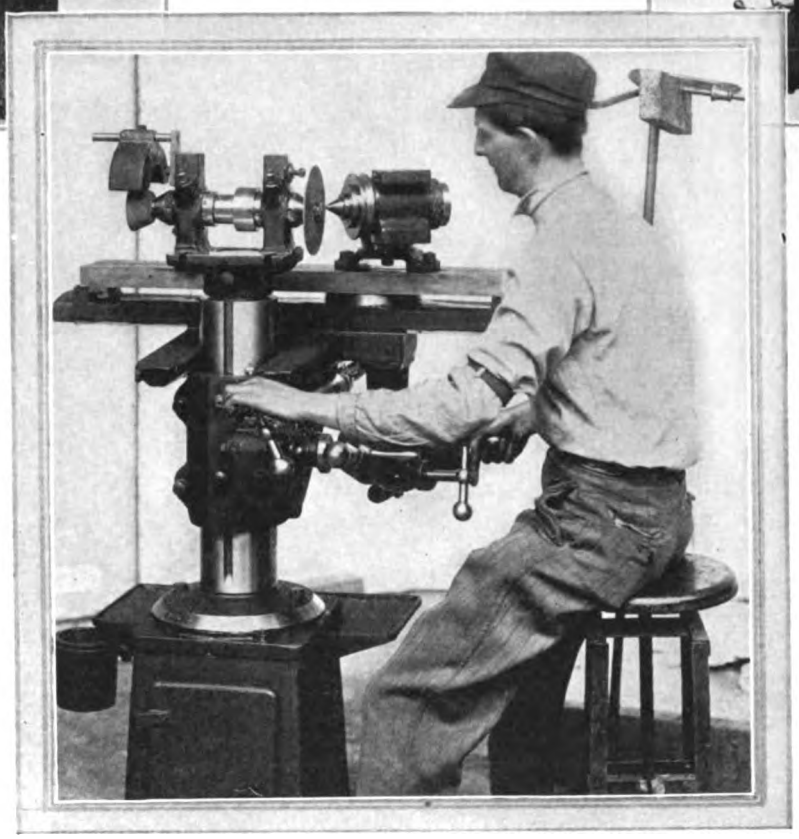


Fig. 13. After milling the flutes and machining the threads taps are sharpened on tool grinders using the same equipment shown in Fig. 12.

Fig. 15. Accurately ground lathe spindles are essential to good production. The illustration below shows how these are ground.



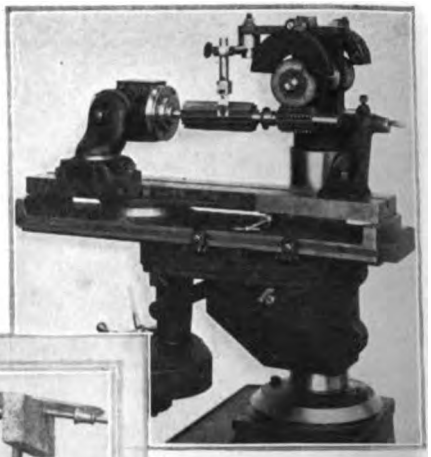
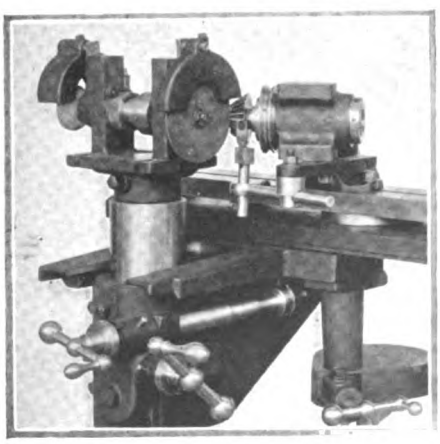


Fig. 14. For sharpening spiral hobs a master form is used to insure the correct argle on the cutting face of the hob.

Fig. 17. About the same practice is followed for sharpening angular cutters as is used for grinding shell end mills.



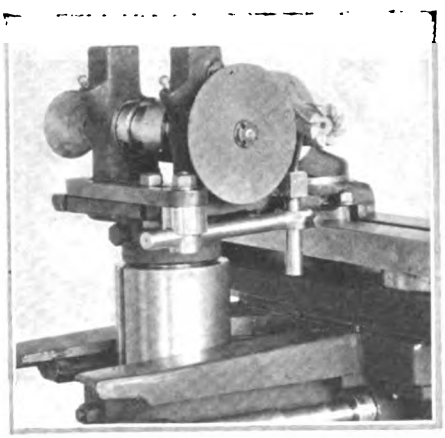
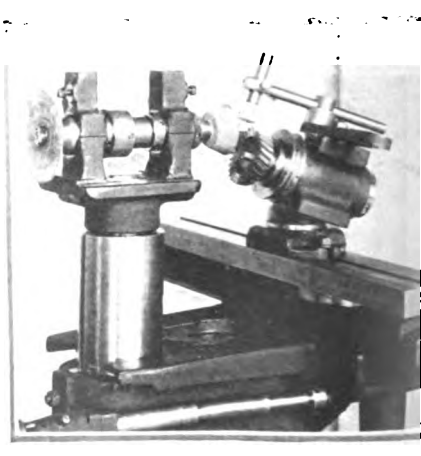


Fig. 16. Spiral end mills are also ground on an arbor using a stop to hold each tooth in position as the cutter is revolved.

Fig. 18. The cutter shown as being sharpened is employed in a gear cutting machine for shaping gear teeth.



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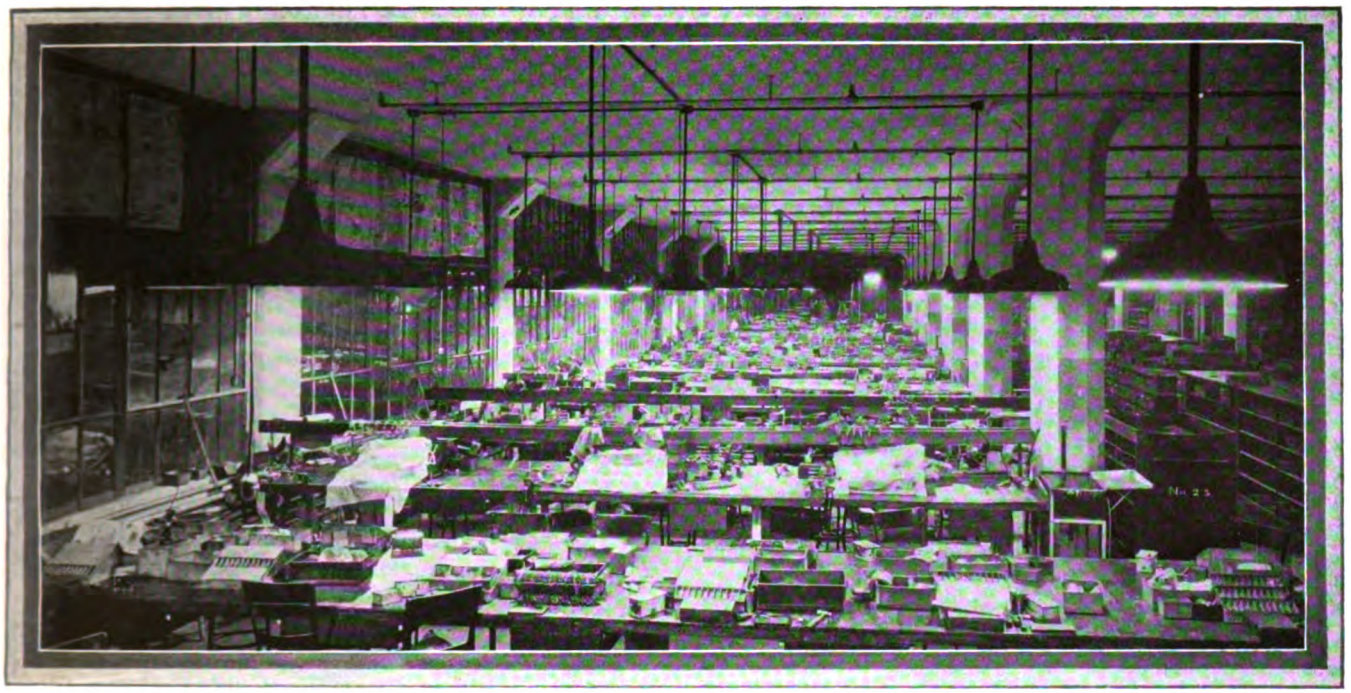


Fig. 1. The interior of a modern manufacturing building showing the advantageous application of surface wiring.

Surface Wiring and Its Relation to the Demand for Better Lighting

Flexibility of Installations Provides Easy Access for Relocating Outlets

By E. I. Bell

THE first consideration of any factory illumination problem is to see that the lights are properly placed. And, right here, at the beginning of the study, the plant manager, more often than not, stops, for the relocation of outlets where the wiring is concealed is no small item of expense.

The idea of burying the wiring system in the walls, ceilings and under the floors in modern factory buildings, thus fixing the location of outlets for light, signal, call and power systems, lends itself to some consideration before the installation is made. It is practically impossible to prelocate outlets accurately, even when the building is being erected for some specific industrial purpose. And, where space is to be rented in the building, to install a concealed wiring system is obviously uneconomical. Inflexibility has no place in modern industrial plant planning. The wiring system should be no exception to this rule.



Fig. 2. In this Philadelphia office building 20,000 ft. of wiring is on the surface. Notice on the column how the two circuits are brought out from the small distribution box. This is also a typical example of the manner in which surface conduit can be made to conform to peculiarly shaped surfaces.

Surface wiring has had a long, uphill drive. The electrical contractor, always slow to accept new ideas, made no exception to this change in his usual way of working. But, contractors have seen the logic of surface wiring, and today many first class electrical contractors can do a surface wiring job that in appearance and service compares favorably with concealed wiring. In many cases the contractor will recommend surface wiring because by doing so he renders his client the most economical service.

All industry is concerned in this matter of surface wiring. The electrical contractor has accepted it as a speedier and more satisfactory method of do-

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Fig. 3. An installation that provides good lighting for a dark hallway. These wires were placed on the ceiling in metal conduit at comparatively small expense.

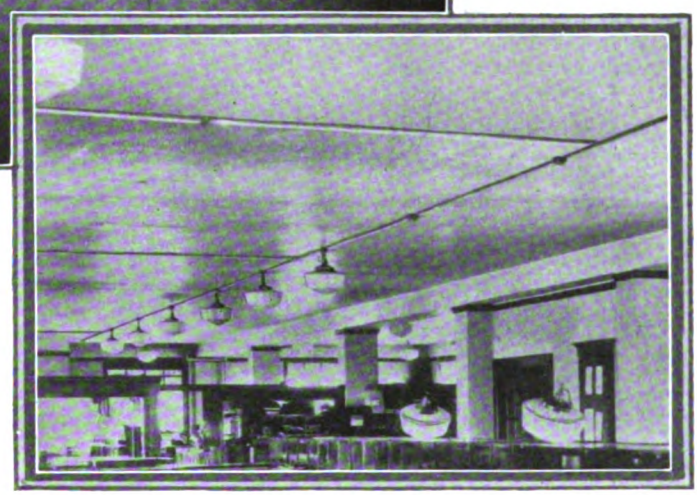


Fig. 4. An office lighting installation showing the convenient plug outlet method of connecting and suspending reflectors from a hook making it easy to take them down for cleaning and renewing lamps.

ing the job. He sees in it more business for himself, for the idea has taken hold. The architect approves of it because it gives his client flexibility for the rearrangement of lighting, signal and call systems that is not otherwise obtainable. The central station interests welcome it. It makes adequate, effective lighting available, at relatively small installation cost. Necessary changes can be made with practically no interference with the workers. More lights are used. Consequently, more kilowatt hours are consumed.

This is not imaginary. There are numerous installations available that show substantial increases in current as the result of bringing the practicability of surface wiring to the attention of industrial plant managers. In one case the current consumed jumped from 54 to 158. In another, one outlet was followed in the course of a single year, by 1,500. And, all this by simply putting at the plant's disposal an economic method of getting additional outlets as required

But the industrial plant itself finds in the application of the surface wiring idea the solution to the problem of adequate lighting. New lights are needed over desks, tables, or machines. If the wires are on the surface the job is inexpensive and quickly done. If the factory is rearranged to make room for new machines, as a matter of safety, and as an aid to production, the lighting layout also needs to be rearranged. It is quite expensive if walls and ceilings have to be opened to shift the wiring system. How much quicker and less expensive is the job, if the wires are on the surface? Usually nothing stands in the way of better production than

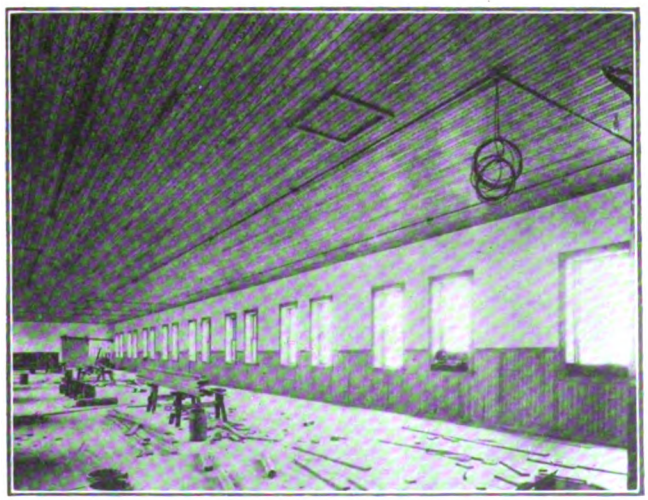


Fig. 5. An interior view of an office under construction for large railroad company showing the manner of applying surface wiring.

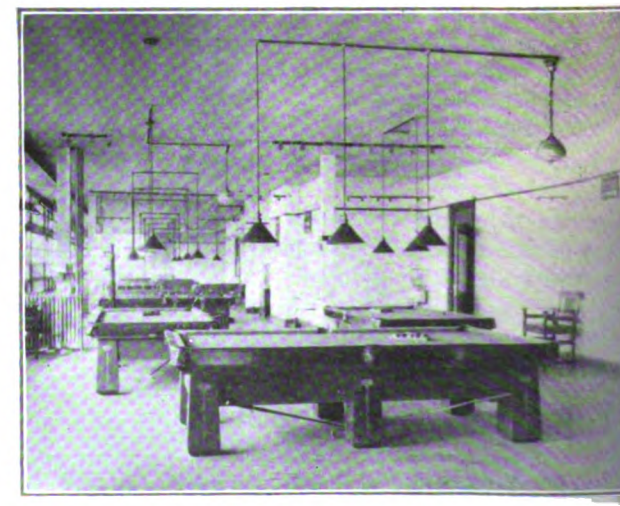


Fig. 6. This loft may be transformed at any time into manufacturing quarters and office or for other uses and the shifting of the wiring system to accommodate almost any needs will entail but little expense. Notice that extra outlets were run from the existing concealed wiring system.

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a slight shifting of lights or a few additional outlets.

Surface wiring is ideal for two classes of work. The first and largest use is for light, signal and call wiring circuits in factories, warehouses, department stores, office buildings, railroad buildings, lofts, schools, hospitals, and the like. The other use, and by no means a small one, is for extension work in homes as well as in all classes of industrial buildings.

Surface wiring of industrial buildings is sensible and logical. Where those conduits and fittings are used that are specifically designed for surface wiring, the appearance is distinctly pleasing. A careful study in most instances will show that better lighting can be obtained by a relocation of outlets.

It is safe to say that many of the industrial buildings using concealed wiring systems are not entirely satisfied with the number and location of their electrical outlets.

Just as it is cheaper to sharpen a tool than to employ a dull one, so it is true that properly placed and maintained lights are cheaper than gloom and shadows.

More and more, those responsible for the wiring of industrial buildings are coming to realize the advantages of having the wiring for light, signal and call systems on the surface. But surface wiring will not stop here. It has obtained recognition in the industrial plants of the country. Its economic advantages demand that it go a step further. A properly designed, and easily assembled, conduit must be produced for those applications where power is to be carried to machines.

Despite the opposition that any change in the code invariably meets, common sense and the demand of industry will force the changes necessary to provide for more convenient methods of getting power to machines.

In spite of the universal acceptance of artificial lighting industry as a whole has been slow to adopt it.



Fig. 7. A good example showing how surface conduit follows the contour in such buildings as this. On the surface there are 15,000 ft. of wiring in this building.

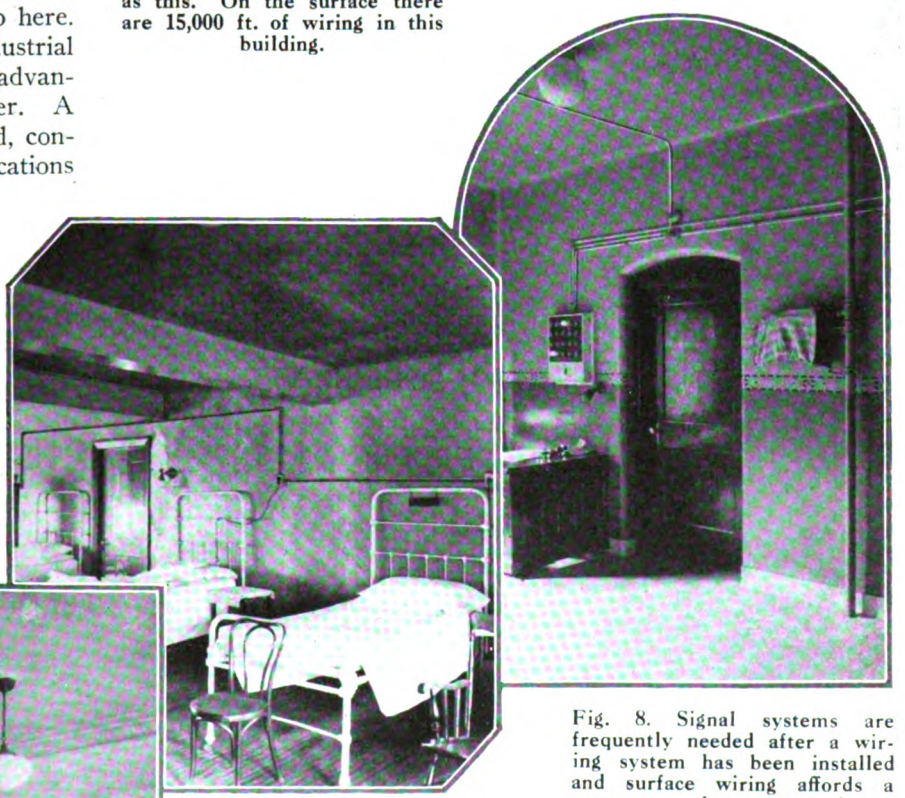


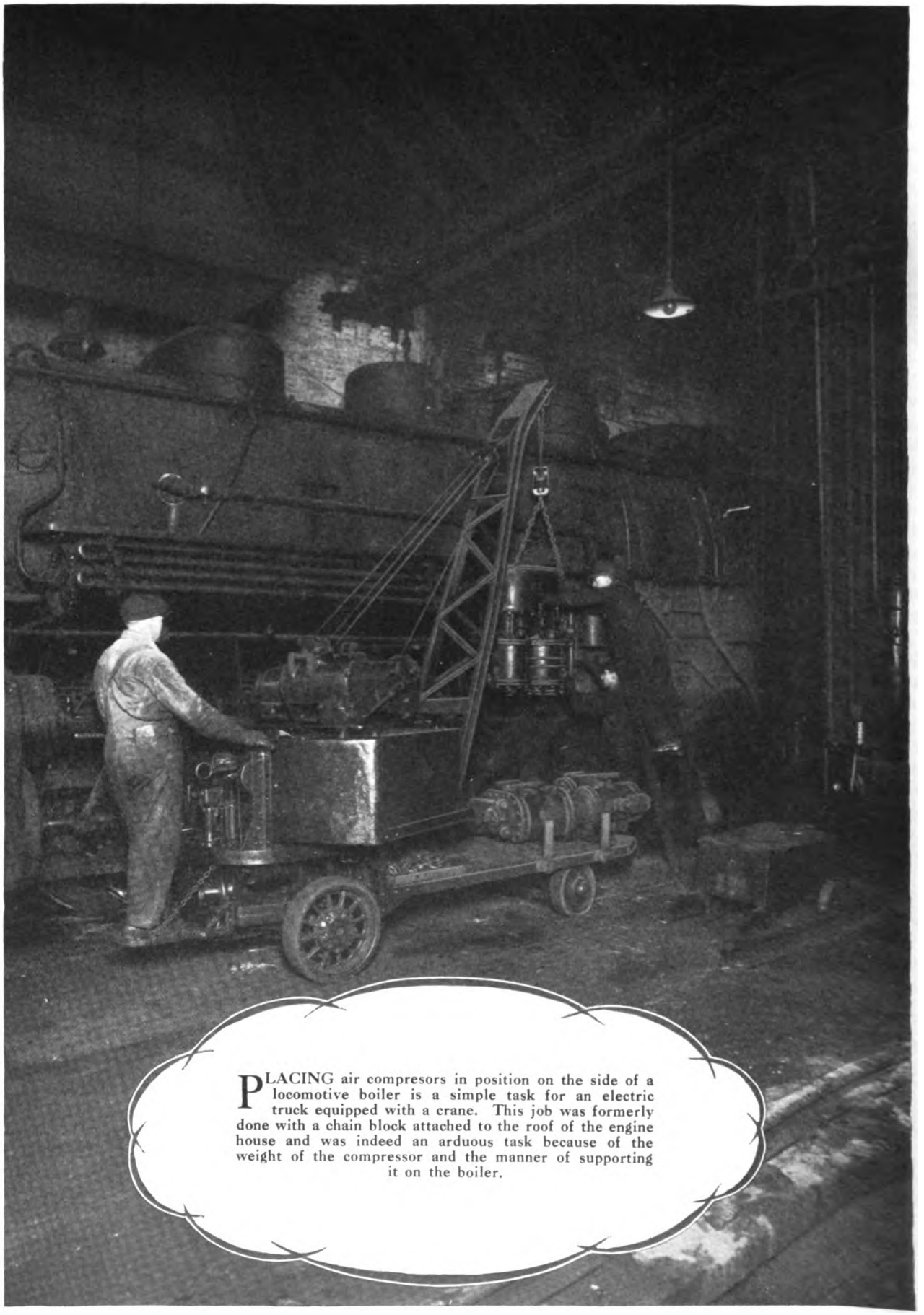
Fig. 8. Signal systems are frequently needed after a wiring system has been installed and surface wiring affords a means to make a neat and economical installation such as this.

Fig. 9. A signal system for a hospital ward. Notice how closely the surface conduit is fitted to the wall and the neat manner in which it is fitted around the beams.



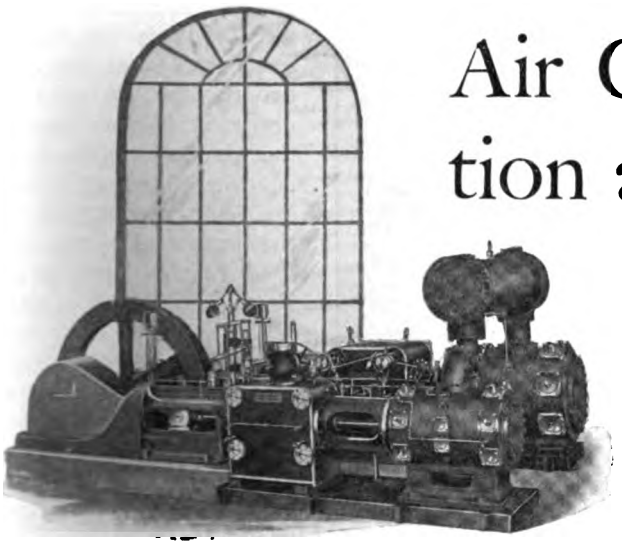
Fig. 10. Part of a 25,000 ft. surface wiring installation in a New York office building.

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PLACING air compresors in position on the side of a locomotive boiler is a simple task for an electric truck equipped with a crane. This job was formerly done with a chain block attached to the roof of the engine house and was indeed an arduous task because of the weight of the compressor and the manner of supporting it on the boiler.

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Air Compressor Lubrication a Factor in Industrial Production

Repair Bills and Delays Are Prevented by Careful Attention

By Allen F. Brewer

Fig. 1. View of a cross compound Corliss two stage compressor showing details of the gravity feed oil system with essential piping and fitting.

COMPRESSED air is a decided factor today in modern industry. The wide variety of uses to which it is adapted, and the extent to which it can be used to speed up industrial production is a marked tribute to the progressive manufacturer and to the science of compressed air engineering which has made this possible.

The air compressor is, of course, the basic equipment involved. Without its ability to furnish air at the desired pressures, the rock drill, concrete breaker, paint spray or any other device designed to operate by virtue of compressed air, would be practically useless.

Industry must, therefore, concern itself with the details of air compressor operation, and especially air compressor lubrication. For, as with any other type of relatively high speed equipment, effective lubrication is essential to successful operation.

This matter of air compressor lubrication is unique, especially from the viewpoint of the management, for it involves more than simply the reduction of friction and power consumption by the inter-position of a film of fluid lubricant between the wearing elements. In other words, the choice of an improperly refined oil for cylinder lubrication, or the use of an excess of practically any grade of oil may ultimately lead to serious accumulations of carbon as a result of continued vaporization or distillation of this oil under higher temperatures of compression.

As a result every care must be observed in the selection of the original oil, not only as regarding its lubricating value, but also the nature and extent of its carbon residue content. Nor is this enough. Throughout the period of operation precaution should be observed as to the manner of usage and rate of application or delivery.

The potential difficulties in event of accumulations of carbonaceous matter will be probable faulty operation of valves, loss of compression due to stuck piston rings, or even explosions in receivers or air lines in certain extreme cases. In proportion as these occur, rate of machine output will probably be decreased, to react in many instances upon the efficiency of operation of such air tools as may be employed in the plant.

All this of course pertains to air cylinder lubrication. Such other wearing elements as may be involved in the average reciprocating compressor will present lubricating requirements akin to similar parts on the average steam engine. They should normally present no serious difficulties. With the rotary or centrifugal compressor or blower, there will be no necessity for lubricating the air side, thus eliminating such problems or possibilities as mentioned above. The bearings will, as a rule, be comparatively simple in their requirements, functioning effectively on lubricants such as would be employed on the average electric motor or centrifugal pump, using grades according to the constructional nature of the bearings.

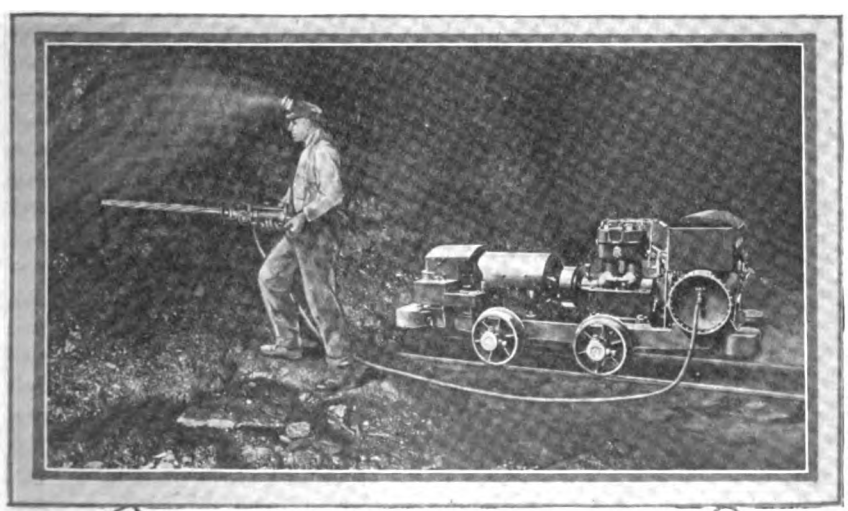


Fig. 2. The portable mine compressor as an accessory to drilling is a decided adjunct in expediting the mining of coal. A feature of such a compressor is the ease with which it can be handled to conform to the work involved.

In the reciprocating machine lubrication of external elements such as crank and cross-head pins, and cross-head guides, can best be carried out in an automatic manner, that is by the delivery or circulation of the lubricant by some

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arrangement which is contingent upon the operation of the compressor itself.

Splash lubrication is extensively employed on certain types of compressors, the crankcase being enclosed, with the oil carried at such a level that a portion of the crank will dip therein at each stroke. In one form of design adaptable to horizontal compressors, by means of a suitable cup or thrower attached to the crank or counter weight, a certain amount of oil will be carried to the top of the stroke, where it will be delivered to a distributing system of piping which will in turn transmit it to all the wearing elements involved. As the oil passes through these it is usually drained back to the crankcase or oil sump for recirculation.

Splash lubrication in certain vertical types of air compressors takes care of the requirements of the entire machine. Where the design is akin to that of the gasoline engine, that is, where the cylinders are directly connected to the crankcase, the oil used in the latter as a bearing lubricant is also relied upon to serve the cylinders, effecting both lubrication and the maintenance of the requisite degree of seal.

Pressure is also employed in the lubrication of certain air compressor bearings by using a suitable oil pump located within the crankcase and operated by the compressor itself, or by the installation of an independent force feed lubricator. Where the latter is used, oil as a rule is circulated but once through the essential wearing element, any excess being allowed to drain to the base of the machine,

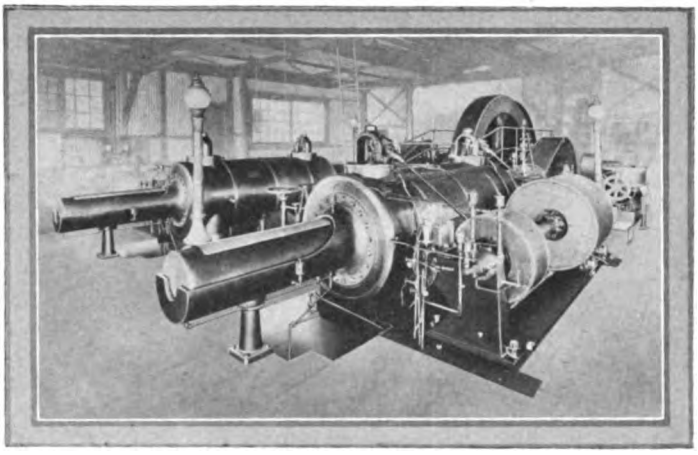


Fig. 3. The uniflow engine as a power element is of such importance as to warrant an illustration of its details and lubrication system involved. Note individual lubricators and the piping layout required.

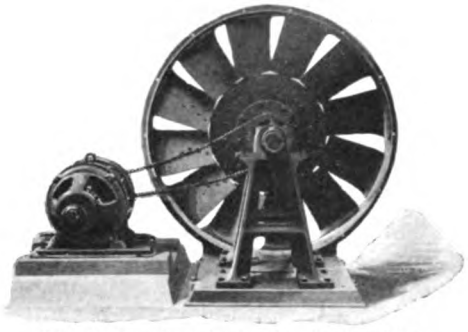


Fig. 4. Another device for the handling or circulation of air is the motor driven blower or fan. Bearings on such equipment are the only parts requiring lubrication, using as a rule the same oil as applied to the motor bearings.

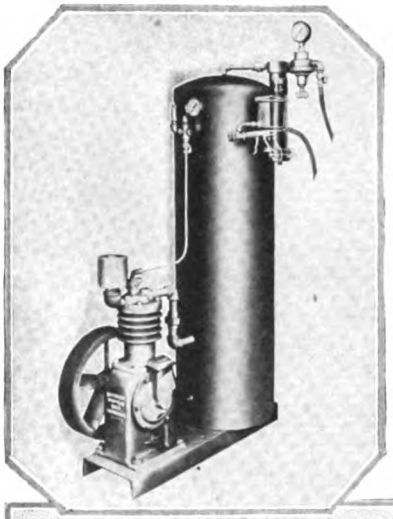


Fig. 5. A paint spray outfit showing the single stage vertical compressor which is necessary for building up the necessary pressures. To issue protection of compressor parts and clean paint a vane type air filter is installed as shown.

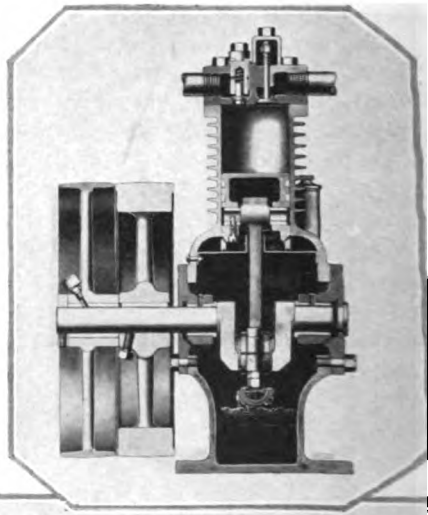


Fig. 6. Details of a vertical single stage compressor of the air-cooled type. The one oil, as shown in the crank-case, serves all the bearings and as well the cylinder walls and piston. This is essentially a system of splash lubrication.

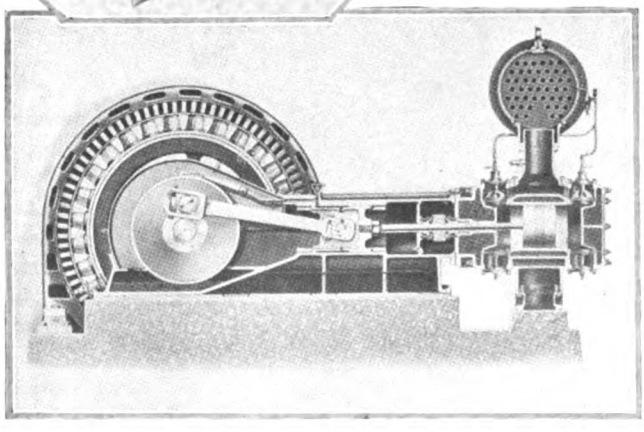


Fig. 7. In this horizontal compressor the crank pin bearings, guides and the connecting rod bearings are splash and flood lubricated, oil being carried by the crank to a suitable oil distributor as shown, which in turn leads it to these wearing elements.

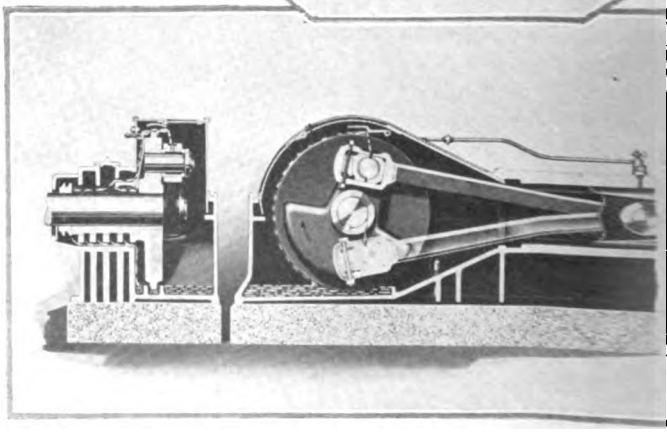


Fig. 8. Oiling system for the crank and other external bearings of a horizontal compressor. Note path followed by oil in its circulation through the wearing elements involved.

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to be used perhaps for more crude varieties of lubrication around the plant or else discarded.

The feature of the mechanical force feed oiler is that it delivers practically the requisite amount of oil to the wearing elements according to the requirements of each. In no sense of the word is flood lubrication attained as in the case of a full splash or modified splash-pressure system. Flood lubrication, on the other hand, is in many instances of advantage, for the excess of oil supplied over the amount essentially required for the reduction of friction will, in addition serve to remove any abnormal heat, and perhaps any dust, dirt or carbon that may have become lodged in bearing clearance spaces.

Splash or flood lubrication, of course, necessitates that the crankcase be practically oil-tight both to prevent entry of dust, dirt or contaminating foreign matter, and any possible loss of oil through leakage. Systems of this nature may be regarded as having a certain advantage in that they are comparatively simple and involve but few parts. In many instances they are so designed as to be practically fool-proof, and will require but a minimum of attention.

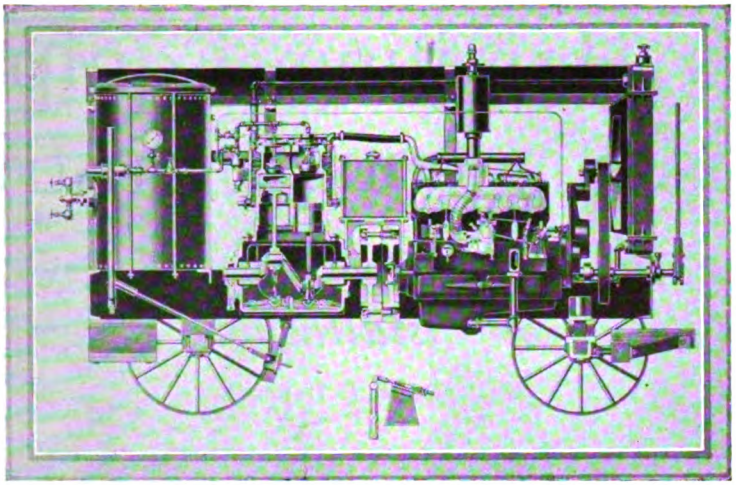


Fig. 9. An interesting sectional view of a portable vertical air compressor of the internal combustion engine driven type. Splash and pressure lubrication of the compressor elements is provided for as indicated, the cranks dipping in suitable troughs at each revolution.

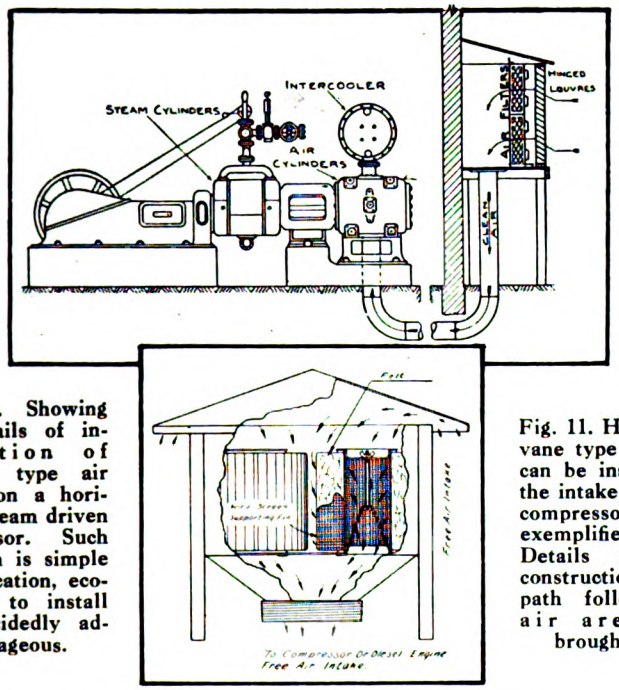


Fig. 10. Showing the details of installation of metallic type air Filters on a horizontal steam driven compressor. Such a system is simple in application, economical to install and decidedly advantageous.

Fig. 11. How a felt vane type air filter can be installed at the intake of an air compressor is well exemplified here. Details of filter construction and path followed by air are clearly brought out.

As a general rule, lubrication of air compressor cylinders will usually be apt to become more of a problem than oiling of bearings. As a problem it is unique in that the effect of the oil on other parts of the system will require quite as much consideration as in the cylinders themselves. In many cases air compressor cylinder oiling will become a matter of comparatively high temperature lubrication due to the fact that compression of air involves a rise in temperature of the latter. It is for this reason that inter-coolers are used between stages in multi-stage machines, and an after-cooler following the final stage of compression.

There is a marked difference between steam cylinder and air compressor cylinder lubrication, even though both may be very much alike from the viewpoint of principle and equipment.

(*Continued on page* 34)

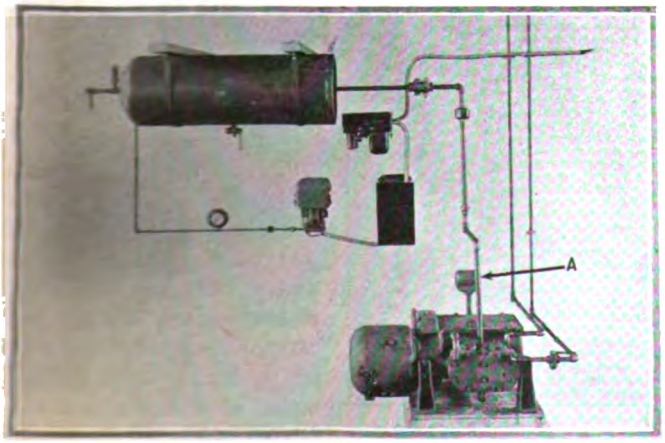


Fig. 12. An air compressor installation of the motor-driven type showing details of piping to air reservoir, electrical equipment and in particular an air intake strainer at A.

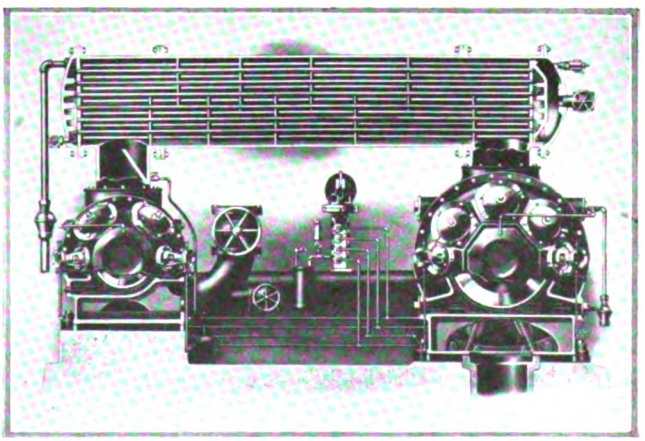


Fig. 13. Section through cylinders and intercooler of a two-stage air compressor. This is an especially interesting view as it brings out inter-cooler construction in detail.

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Materials Handling Equipment in Miscellaneous Industries

An Explanation of the Operation of Several Types of Installations

By Edward J. Tournier

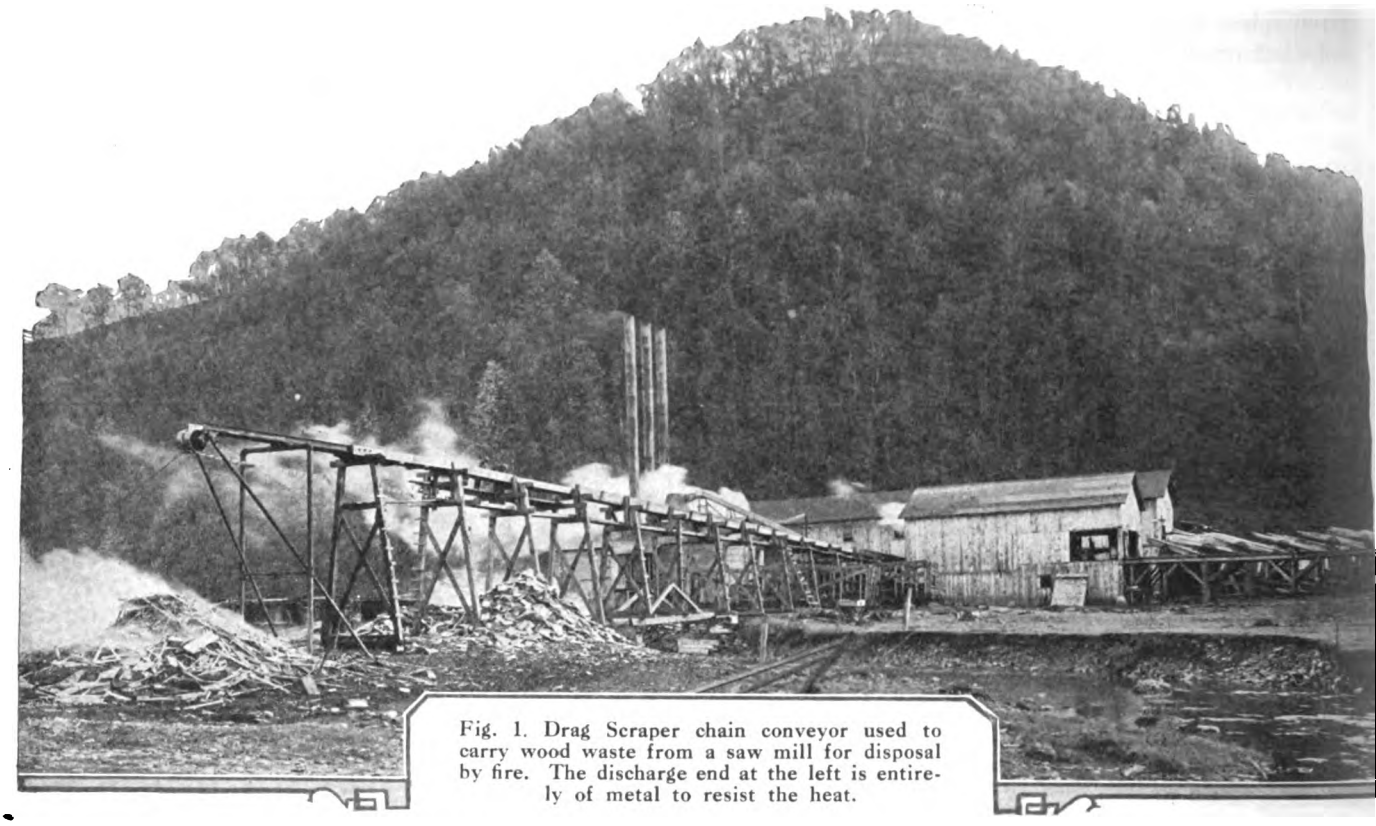


Fig. 1. Drag Scraper chain conveyor used to carry wood waste from a saw mill for disposal by fire. The discharge end at the left is entirely of metal to resist the heat.

GIVING thought at random to the operation of any industry it must be increasingly evident that the use of mechanical means for handling materials is the thing which makes possible the enormous production necessary to satisfy the requirements of business and the general public.

From making boards and packing boxes in remote mountain districts to building a road in a Long Island suburb the trail of the machine extends wide and long.

A West Virginia saw mill finds that its waste lumber and saw dust are an insufficient source of fuel for its boiler house and disposes of this waste by burning it on the ground. Since the buildings are of frame construction the fire must be kept away from the plant. This is accomplished by the use of a single strand drag scraper chain conveyor which discharges some 80 or 100 ft away. The discharge end of the trough is of steel plate in order to resist the effect of heat.



Fig. 2. The pulp wood stacker shown is used to form the most valuable wood piles in the world. These piles are the daily source of supply of pulp mills and single piles sometimes have an insurance value of over three quarters of a million dollars.

The principal source of daily raw materials supply and one of its valuable possessions, is the wood pile of a pulp and paper mill. This log pile which is sometimes 100 ft. high cannot possibly be piled up by hand. The combination of a horizontal conveyor and a stacker is used for this purpose. The stacker consists of a wheeled truck on which

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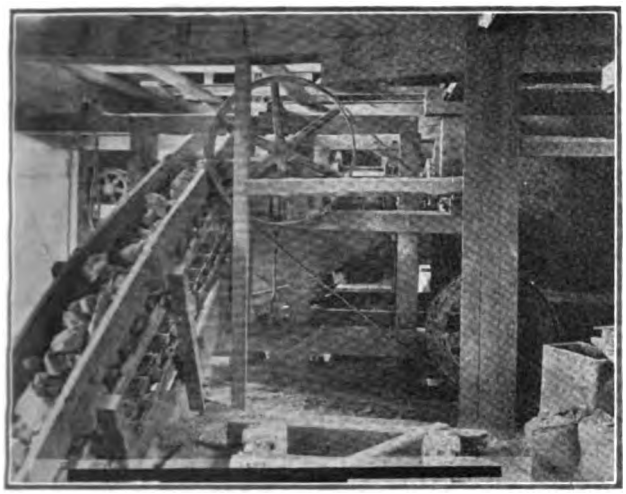


Fig. 3. A double strand roller chain pan conveyor is used to carry lump lime from the kilns to the screens in the preparation of building lime.

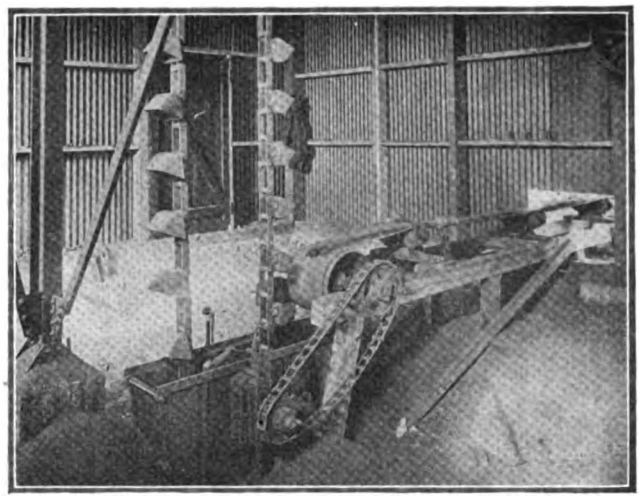


Fig. 4. The discharge end of a belt conveyor and loading point of a bucket elevator are shown handling dried fertilizer materials.

mounted an inclined cantilever frame of structural steel which carries a steel drag chain and trough. The stacker is mechanically propelled on a standard gauge track and receives logs from the ground conveyer at any point. The wood is then discharged over the head of the stacker conveyor, forming a pile on the ground.

Preparing building lime includes a number of handling operations, to and from the kilns, and requires equipment capable of handling both hot and cold materials. One of the most important is that of screening and sizing. Lump lime received from the kilns is carried to the screens by steel pan conveyors mounted on double strands of chain.

Making fertilizers is another industry whose processes are accelerated by the installation of conveying equipment. Ground bone and dried tankage are taken from the dryers by belt conveyors and stored in storage bins by means of bucket elevators previous to packing for shipment.

The application of sand preparation equipment in foundries is not limited to the large plants. A small jobbing foundry may install a single strand elevator and

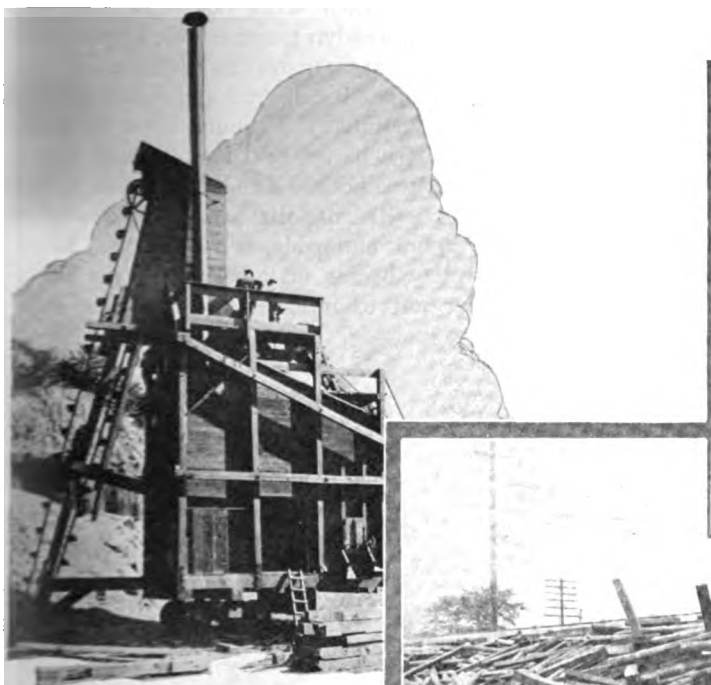


Fig. 6. The combination of elevating and screening equipment, storage bins and power plant on a flat car enabled a road contractor to materially reduce his costs of construction.

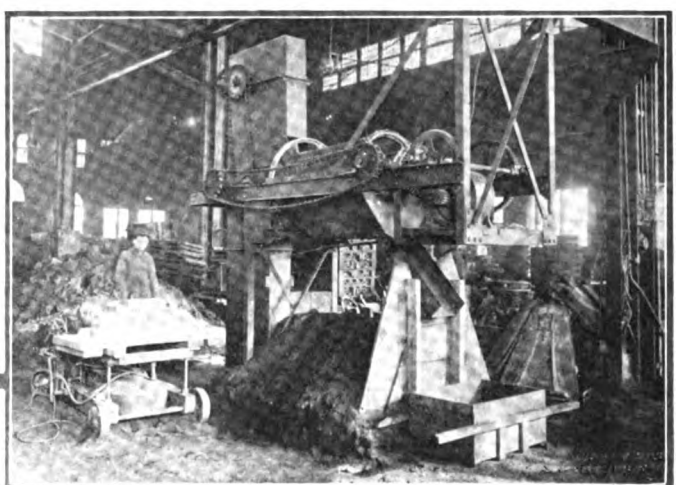


Fig. 5. Small job foundries may install inexpensive bucket elevators and screens for reclaiming used molding sand. The use of even a single unit will reduce production costs in small foundries.

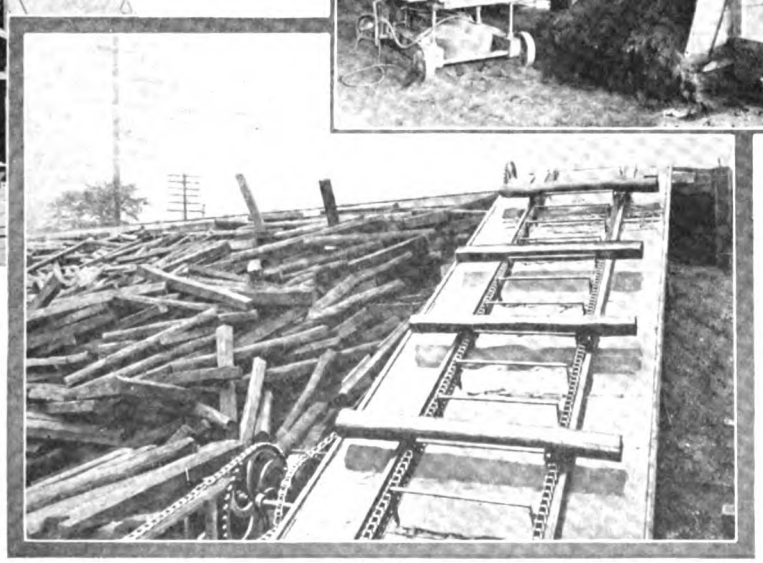


Fig. 7. Typical installation of a double strand chain conveyor for handling railroad ties.

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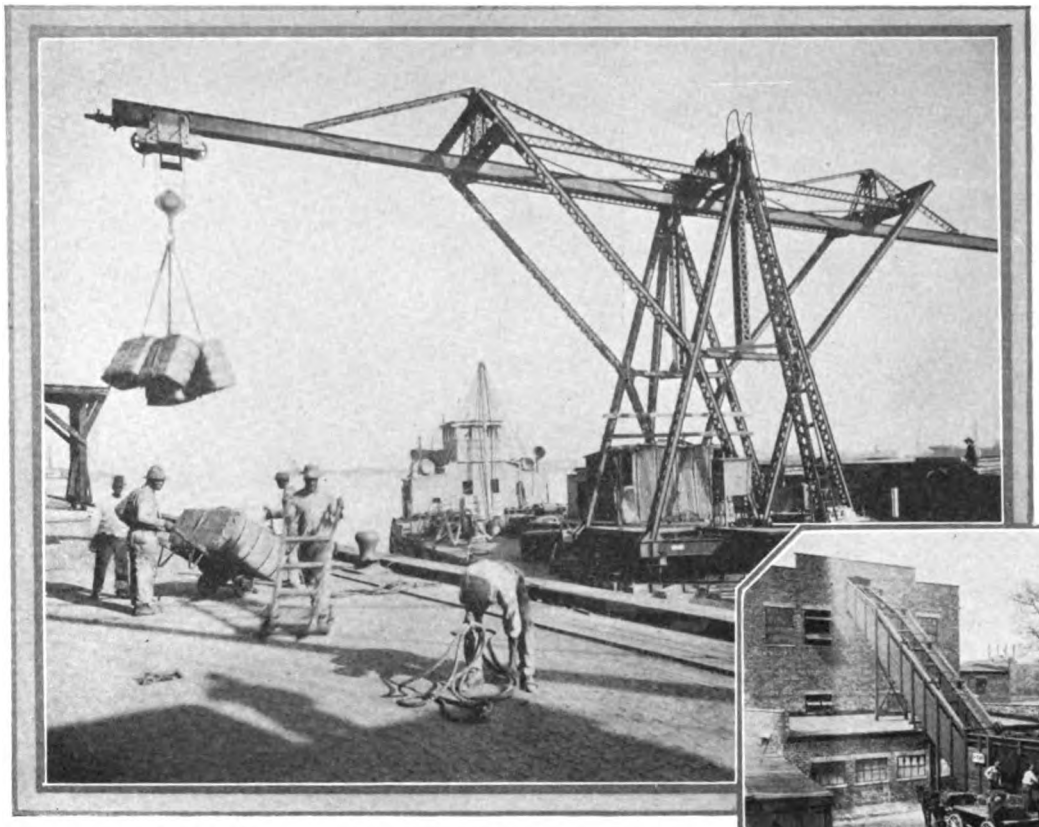


Fig. 8. A folding revolving crane, electrically operated is mounted on a barge, for transferring mixed cargoes.



Fig. 9. A steel drag chain conveyor in use at a straw board factory for handling straw, either loose or in bales.

a screen and thereby save considerable labor, as well as obtain greater efficiency of operation, which means lower production costs.

Taking advantage of a local source of materials supply, a Long Island road contractor was able to materially reduce his construction costs. A timber storage bin was built on a discarded flat car, which, by the use of relaying rails, could be moved where required. A chain and bucket elevator carried sand and gravel from an adjacent sand bank and discharged to a revolving screen over the bins. Materials were then discharged through chutes as needed.

Handling mixed cargoes from Mississippi River barges at New Orleans, railroad ties at Saginaw, bales of straw in a New Bedford straw-board factory and mixing chemicals in a Brooklyn paint works, are diversified but typical examples of materials transfer by machinery especially designed for special applications.

The cargo handling derrick is mounted on a turntable carried on the deck of a barge, and is equipped with a trolley, a hoist and a crane hook. The load may be picked up from a dock, carried across the barge and deposited on board a ship or lighter alongside, or vice-versa. When not in use, the trolley beams may be folded up like a jack-knife in order not to interfere with harbor shipping.



Fig. 10. A belt conveyor in its elementary form carries empty cement bags to the cleaning machines. Note the absence of supporting structures.

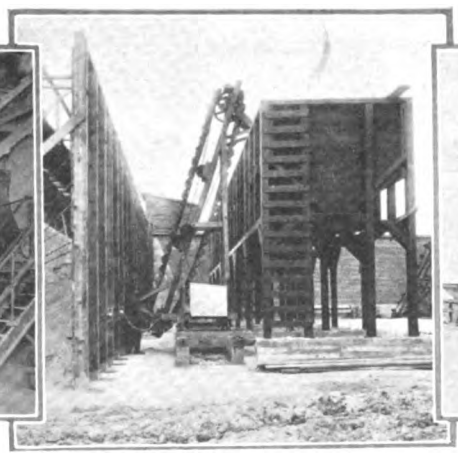


Fig. 11. Simple and inexpensive arrangement of a traveling continuous bucket elevator transferring sand, stone, etc., to bins in a builder's supplies yard.

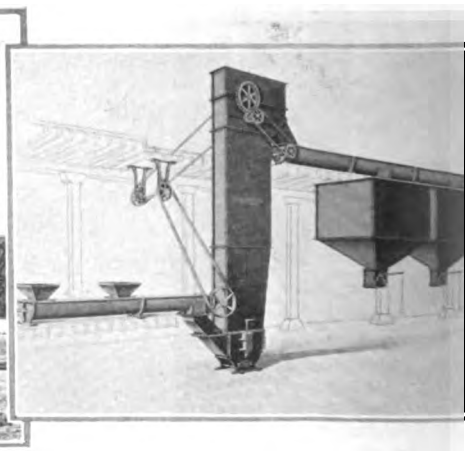


Fig. 12. Mixing and storing chemica with screws conveyors and a buck elevator.

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The New East River Power Station of the New York Edison Company

A Steam Generating Unit of High Capacity and High Efficiency

BECAUSE of the demands for increased power and in order to provide for increased future demand, the New York Edison Company on November 23, 1926, completed and placed in operation what is reported to be a steam generating unit of enormously increased capacity, with low maintenance and labor costs and high efficiency.

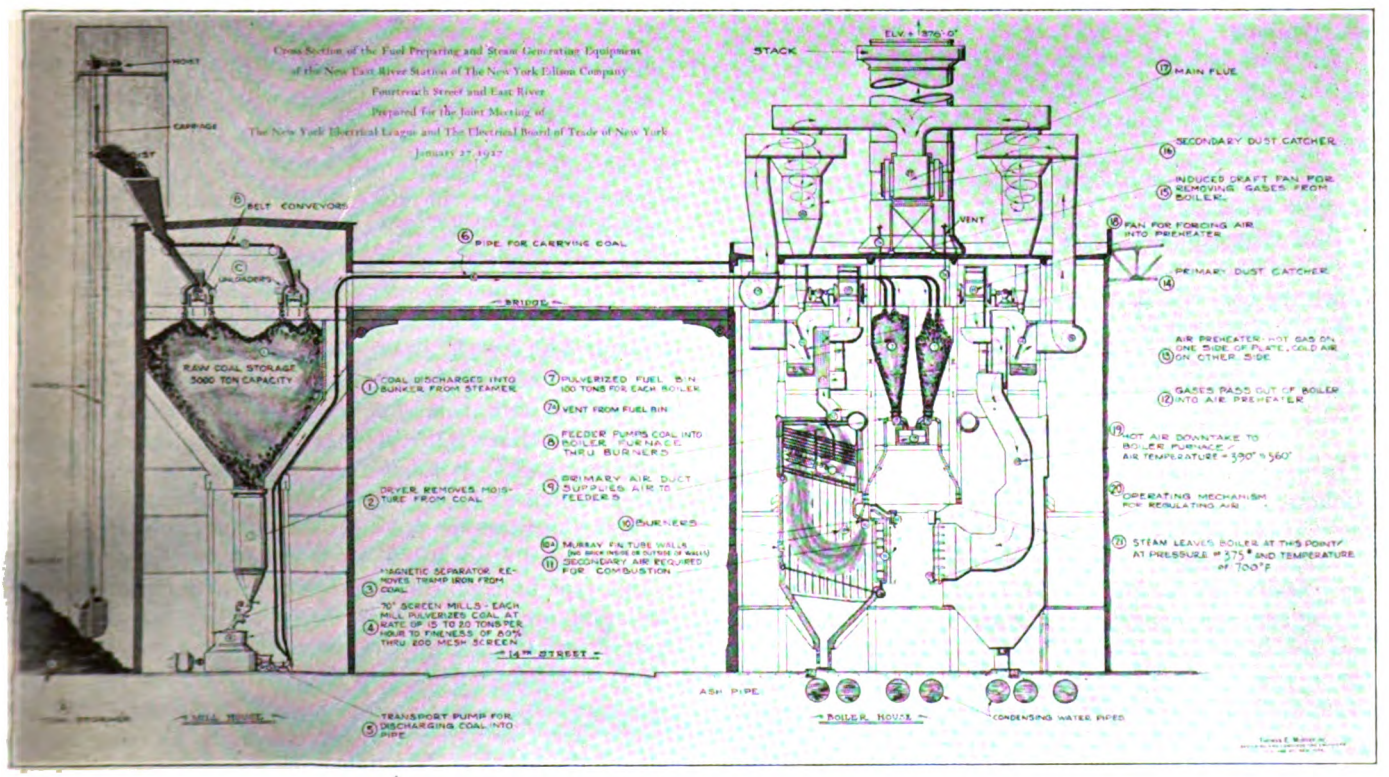
Some years ago Thomas E. Murray, Senior Vice-President of the company, in an endeavor to increase the steam producing capacity of power house boilers and decrease the cost of furnace maintenance, conceived the idea of a completely water-cooled boiler furnace wall of improved design completely eliminating the use of fire brick and refractories with their attendant deterioration and repair cost. This design was given a thorough test at the Hell Gate Station of the New York Edison Company and forms the basis for the design of the new East River plant.

The property affords suitable accommodations in the main structure for nine steam turbines of the largest size. The first two, already installed, having a capacity of 60,000 kilowatts each. Succeeding ones will probably be of larger size as the state of the art has now sufficiently advanced to enable 120,000 kw. single shaft units to be accommodated. This will bring the ultimate capacity of the plant to over one million kilowatts. There is also adequate provision for a mill house for pulverizing the coal, for adequate coal storage, and for exits for the high tension cable feeders and tie cable connections.

The construction of the East River station presented many problems; the most important and also the most difficult were the building foundations and the huge condensing water tunnels.

The entire building plot was covered with wood piles, super-imposing upon them, a reinforced monolithic concrete slab for distributing the weight,—the column footings being embedded in the concrete. A sufficient number of cast-iron pipes to carry the intake condensing water to the condensers and the return to the East River of the discharge, was placed in the foundation itself, thus avoiding deep construction, except along the bulkhead.

An adequate continuous area for immediate requirements and for future expansion, both as to building construction and high tension feeder outlets, together with favorable water-front conditions, providing adequate water depth, some 30 feet for docking coal-carrying



A phantom drawing, showing the salient features of design and operation of the fuel preparing and steam generating equipment at the new East River power plant of The New York Edison Company; Fourteenth Street and the East River, New York City.

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ocean-going steamers of 10,000 tons capacity, determined the selection of this plot, with a river frontage available of nearly 800 feet and with a plot-depth inland of some 1,600 feet. The boilers have a normal commercial rating of 50,000 lbs. of steam per hour, but with these improvements they can be operated at continuous overloads, so as to produce 250,000 lbs. of steam per hour, something like 500 per cent. of rating. They are of the cross-drum type with the boiler tubes inclined at about 15 deg. to the horizontal—the unique feature being the enormous combustion chamber which is entirely enclosed in water-cooled walls, no brick work or refractories being used in the construction.

The wall surface is formed by fin type tubes, completely exposed to the fire on the furnace side and so designed that no refractories are required, while external radiation is prevented by a plastic coating on the outside of the tubes, away from the fire, from four to six inches thick.

Steam Preheaters and Superheaters Both Used

The boilers are provided with steam superheaters, and preheaters supply hot air for combustion, the hot air being injected with the powdered coal. Draft requirements are provided by means of forced draft through the air preheaters and induced draft to the stack.

The flue gases are washed in a wet washer or cinder catcher and then passed through enormous centrifugal blowers, which catch the fine dust before the flue gases are finally delivered to the colossal stacks 375 feet high, with a diameter of 22 feet. There will be seven stacks in the completed station.

Disposal of the dust and ashes is provided through a hydraulic flushing system.

In the mezzanine around the boilers are located the feed water heaters, boiler feed pumps and steam and water piping.

The heat balance system is of the regenerative type, bleeding the turbines at three points; steam pressure of 375 lbs. is carried, superheated to a total temperature of 700 deg.

The course followed by the fuel is shown by the accompanying cross-section.

Two coal unloading towers with a capacity of about 4,000 tons per ten-hour shift each, will be provided, from which the coal will be carried by conveyors either to storage or to the skip hoists, which will elevate the coal into the raw coal bunkers (1) on the top of the mill house, located on the south side of Fourteenth Street.

Coal Pulverizers Are in Mill House

In the mill house will be located besides these raw coal bunkers, the steam dryers (2) for drying the coal and the screen mill pulverizers (4) to grind the coal to a sufficient fineness. The pulverized coal received from the grinders in the mill house is forced by air pressure through transporting pipes across the connecting bridge into the individual bins of the boiler house (7) located above each boiler, from where it is picked up by the feeders (8) and with the compressed air from the primary air duct (9) the current of powdered fuel is forced into the furnace through the burners.

The small amount of unconsumed combustible falls between the tubes forming the water screen located at the bottom of the furnace, and is precipitated into the ash pit, to be finally drawn out into the ash discharge conduit.

The gases resulting from combustion pass out of the boiler through the uptake (12) into an air preheater (13) and into the primary dust catcher, wet type (14), from which point the gases pass through the induced draft fans (15) to the secondary dust catchers or centrifugal cyclones, located on the roof of the boiler house, from where the gases pass into the main flue and then into the stack. The combined effect of the two types of dust catchers in series results in a thorough cleansing of the furnace gases before they reach the stack, the solid particles being caught in the water bath of the primary dust catchers or precipitated by the centrifugal action of the cyclones.

The preheated or secondary air supply for combustion is discharged through the forced draft fan (18) and air preheater (13) into the hot air downtakes and into the front wall of the furnace, where the hot air mixes with the powdered fuel and air forced through the burners and ignited in the furnace, completely filling it with intensely hot gases in perfect combustion.

After an exhaustive analysis of the economics of steam versus electrically driven auxiliaries, it was determined to adhere to the usual practice in New York Edison stations, using steam drives for the essential units on which continuity of service absolutely depends, having in mind, as far as possible, also low first cost. Some of the other auxiliaries are driven from the d. c. house system, consisting of four 500 kw. steam driven d. c. turbo-generators and two storage batteries, but the coal preparation motors and the remaining auxiliaries are driven by a. c. motors, taking their power through transformers directly from the main bus. This combination is believed to give the maximum guarantee of continuity of service under all conditions with good economy and minimum fixed charges.

Turbo-generators Operate on Regenerative Cycle

The present installation of prime movers consists of two 60,000 kw., 25 cycle, 1,500 revolution, three phase, 11,400 volt turbo-generators, which are operated on the regenerative cycle, bleeding at three points. The condensers have each 47,500 sq. ft. of surface and are provided with duplicate hot-well and circulating pumps and steam jet air pumps. The feed water will be heated from the condensate temperature of around 80 deg. F to about 340 deg. F. before entering the boilers.

It is expected that this station will deliver a kilowat hour on the station bus for one pound of good coal.

The 40,000 k.w. 25 cycle-60 cycle frequency change set now installed at East River is a duplicate of the se now installed at Hell Gate Station, consisting of an in duction synchronous set with a 60-cycle induction gen erator excited from the 25-cycle system. The advantag of this type of frequency changer set is that the 25-cyc excitation on the motor of the 60-cycle unit acts as transformer tie, as well as a power tie.

The electrical galleries on the north side of the build ing are of the isolated phase type, the phases being c three floors, separated vertically, with the operati mechanisms above the third floor. Both main and auxilia busses are divided into nine sections, each served by o generator and twelve outgoing feeders. One of the se tions has, in addition, a connection to the frequen changer. The standard H connection is installed, wi

(*Continued on page* 36)

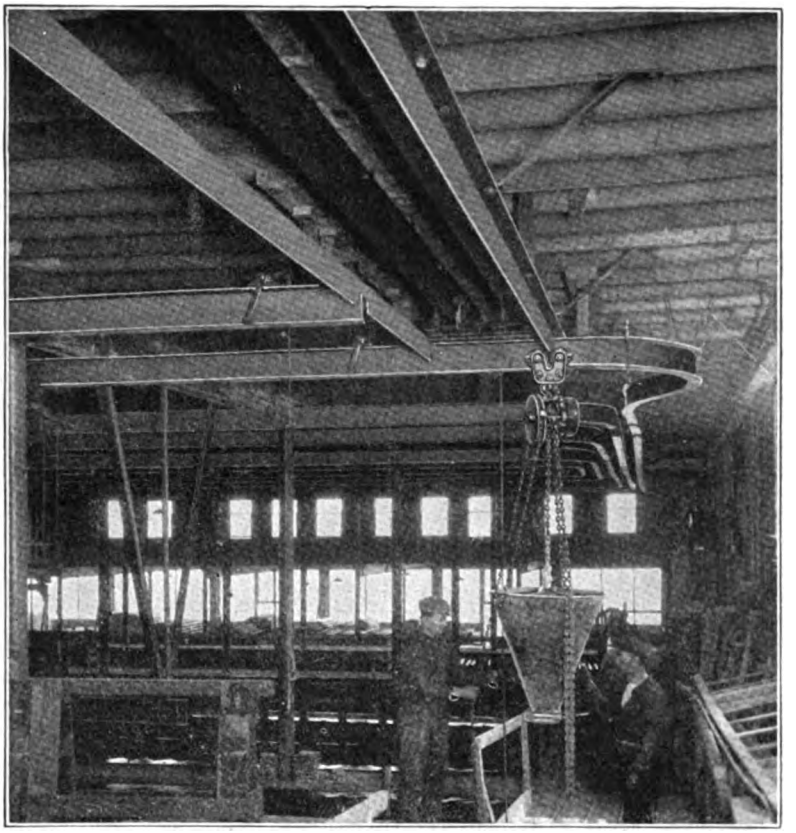
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J. W. Blades, Manager, Lally Column Company, Brooklyn, N. Y., says:

"In erecting our new factory, we standardized on Richards-Wilcox 925 Ball Bearing OveR-Way Trolleys to convey concrete and handle the loading of our columns. Over 20 of the R-W trolleys, in conjunction with hand and electric hoists, operate on 2500 feet of I-beam throughout the factory.

"These trolleys are in constant use, handling hoppers of concrete from the mixer to the column forms. Handling has been greatly facilitated by our development of a shifting table composed of 5 I-beams from which are hung hoists carrying concrete. This table runs on R-W trolleys hung from I-beams, and by shifting it back and forth we can deliver the concrete to any track desired.

"With our equipment of R-W trolleys and hand and electric hoists we can do with 2 men twice as much work as we formerly did with 6 men when doing the work manually in our old factory. The elimination of 4 men represents a $6,000 a year labor saving; but as the 2 men turn out twice as much work as 6 used to, this saving is more than doubled.

"Loading the finished columns with R-W trolleys and hoists has speeded up this work and saved much heavy lifting, which reduces our labor turnover. The trolleys are also used to convey bags of cement, iron pipes, steel plates, etc., around the factory.

"Richards-Wilcox trolleys have never caused us any trouble and give excellent service."

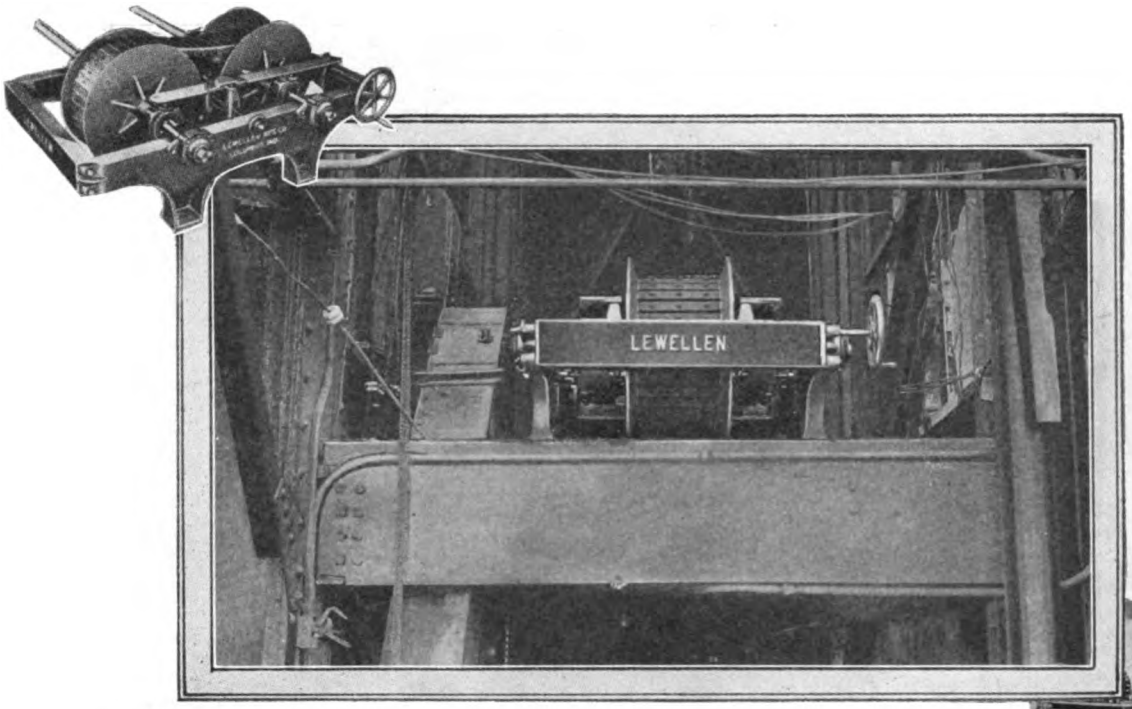
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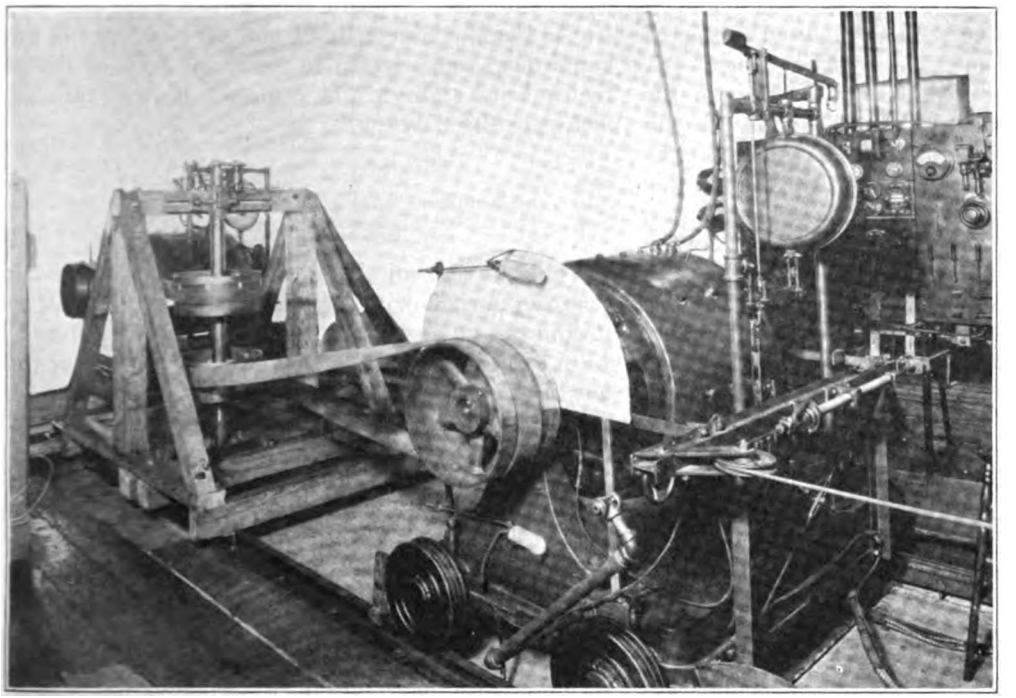


Fig. 1. A general layout of the arrangement of apparatus used in studying the transmission capacity of horizontal quarter-turn drives.

Experiments With Horizontal Quarter Turn Belt Drives

Interesting Results Obtained in Tests of This Form of Power Transmission

By R. F. Jones
Research Engineer

UNDER the auspices of the Leather Belting Exchange some very interesting data and information were obtained relating to the operation of quarter turn belt drives and the following was abstracted from a recent published report of these tests:

The object of the experiments was to study the transmission capacity of horizontal quarter turn drives, as compared with normal horizontal drives, and thus establish a more correct basis of design for such drives. Another object was to try out certain combinations of pulleys and center distances in the hope of learning more about the practical layout of quarter turn drives.

Primary considerations in the design of the quarter turn apparatus were measurement of horsepower transmitted, measurement of slip, measurement of initial or slow running tension, flexibility in the use of pulley sizes covering a range from 6 to 30 inches in diameter and center distances ranging from 5 to 15 feet, and ease in converting the apparatus from the normal drive to the quarter turn drive or vice versa.

A general layout of the scheme used is shown in Fig. 1. The driving dynamometer of a 100-horsepower belt testing apparatus was employed to drive a vertical countershaft through a quarter turn belt (left hand belt in Fig. 1), and the counter shaft drove the absorbing dynamometer through the test quarter-turn belt (right hand belt in Fig. 1). Since the driven dynamometer (at right in Fig. 1) was mounted on a track it could be moved back and forth to allow center distances from 5 to 15 feet on the test drive, and the tension was weighed on the tension scale as usual. The tension scale is attached to the right hand end of the steel cable which runs off the right edge of Fig. 1. The frame for the counter shaft was bolted solidly to the track at a convenient distance from the driving dynamometer.

It will be noticed from Fig. 1, that the counter shaft is supported at the bottom by a step bearing and at the top by an ordinary vertical bearing. These bearings were mounted on sliding bases which allowed the counter shaft a sidewise movement of 14 inches, to accommodate

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pulleys up to 30 inches in diameter. This was necessary because the center of the lower pulley on the counter shaft had to be in a horizontal line with the bottom center of the pulley on the absorbing or driven dynamometer.

The counter shaft constituted the driving unit of the test drive, and therefore the contactor end of the slip meter was attached to the upper end of this shaft, as shown at the top of Fig. 1. The rotating lamp was mounted as usual on the absorbing dynamometer shaft, and its rotations measured the slip of the belt between the counter shaft and this machine.

The view in Fig. 2, taken from the driving dynamometer end, shows the quarter turn drive which supplied the power. A heavy double belt was used to furnish steady power at the jack shaft with little slip. The driving dynamometer pulley had to be in line with the inside edge of the upper counter shaft pulley. For each pulley change the counter shaft was moved to bring the lower counter shaft pulley into line and therefore the driving dynamomter had to be moved to keep it in line with the upper pulley. This dynamometer was mounted on slotted rails long enough to allow the necessary sidewise movement.

To change the apparatus back to the normal drive, the counter shaft was removed from its supporting frame, and the driven machine and tension scale carriage were moved up to give the proper center distance. The driving dynamometer was then moved to the left until correct pulley alignment was attained. At short center distances the whole counter shaft frame had to be moved from the track.

The power transmitted by the test belt to the driven dynamometer was fed back to the line, thus reducing the power consumption of the apparatus about 60 per cent.

An important feature in comparative belt tests is the use of belts representative of the different conditions of surface and elasticity found in normal service. In the present case, one leather belt possessing a normal high friction surface was chosen as representative of leather belts at their best. Another leather belt having a buffed grain surface represented the class of belts whose coefficient of friction has become reduced through lack of care or misuse. A third belt, known to be still lower in transmission characteristics, and very constant in surface conditions, was selected to represent belts of the lowest transmitting ability. These three belts with their dimensions are listed below.

Belt. No.	*Material*	*Width in.*	*Thickness ins.*	*Weight oz. sq. ft.*
J-38	Single leather, buffed grain.....	4.00	.205	15.3
J-40	Fabric and rubber.....	3.92	.195	17.2
J-41	Single leather, normal grain.....	4.04	.221	16.3

The first transmission comparison between the quarter turn and normal drives was largely an experimental effort to find out how to make such tests. Belts J-40 and J-41 were carefully run in on the normal drive before making any tests. Then normal drive tests were made on 18-inch cast iron pulleys running at 2,000 ft. p. m. the belt being under a slow running tension (S. R. T.) of 288 lbs. and at a center distance of 13 feet. As soon afterwards as the apparatus could be converted to the quarter turn drive the belts were put on the test quarter turn drive, and tested under the same conditions. The resulting hp. vs. per cent. slip curves given on Fig. 3, show the normal drive to be superior in each case. However, something appeared to be wrong especially with J-41 because the two curves were widely apart during the creep region, which usually extends up to 1.5 per cent. slip or more, with this type of belt. Since creep is dependent upon the tension arrangement in the two strands of the belt, and the elastic properties of the belt, the curves should have been closer together than they were below 1.5 per cent. slip.

It is probable that this effect was due to the omission of running in before testing on the quarter turn drive, which gave the belts no opportunity to conform to this drive. It was omitted because running in between the sets of comparative tests might have changed the belt surface, and in that way destroyed the accuracy of the tests. Another possible source of error was due to the fact, that as a leather belt is run in on a normal drive it improves more rapidly in the center, resulting in a lower coefficient of friction at the edges than in the center

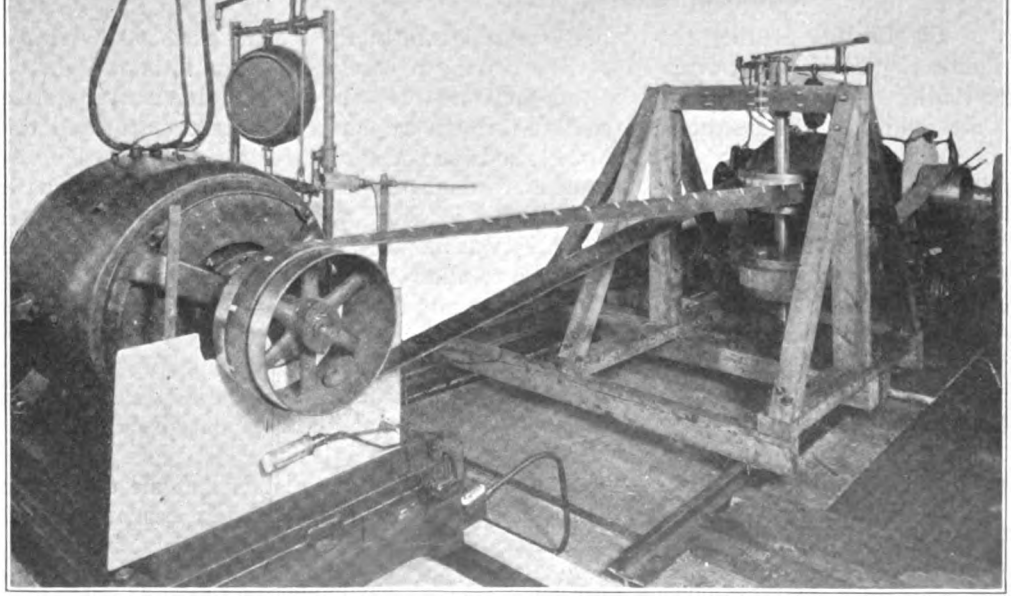


Fig. 2. A view taken from the driving dynamometer end, and giving a clear illustration of the quarter-turn drive.

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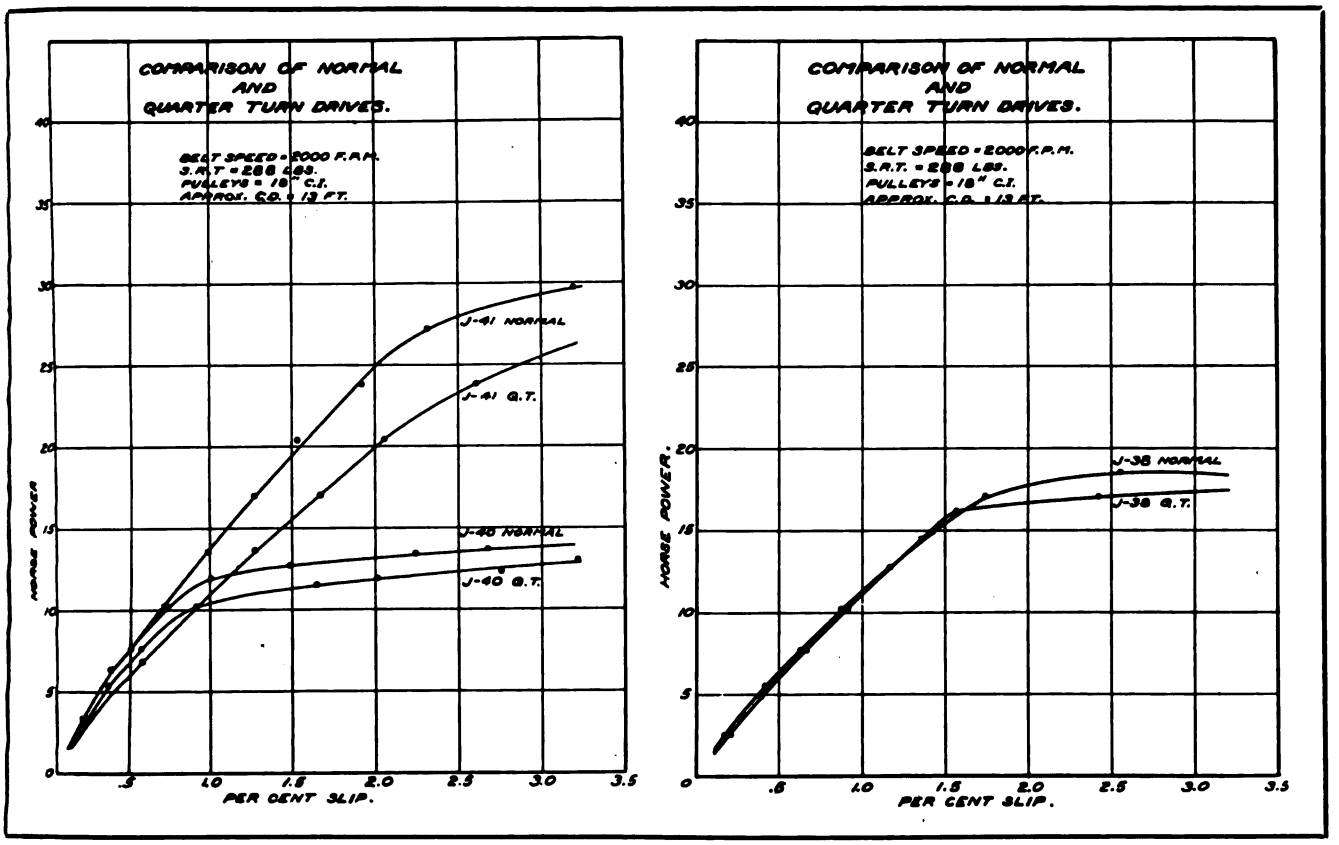


Fig. 3. Curves showing horsepower vs. per cent of slip, on a preliminary test, for normal and for quarter-turn drive.

Fig. 4. With the lessons learned from the previous test (Fig. 3) the belt was first "run in," and the method of testing revised; resulting in the above curves.

When this belt is put on a quarter turn drive, the leather at one edge is under more tension than that in the center or on the other edge, and therefore the real intimate contact between belt and pulley, which does the pulling, takes place on one of the edges having a lower coefficient of friction than the center.

As a remedy for these two causes of error, we tried running in the next belt and testing it on the quarter turn drive first. No running in was done before the normal drive test, and the belt seemed to conform to the pulleys even after being stretched out of shape by the quarter turn drive. This belt was J-38 whose curves are plotted on Fig. 4. Notice that the creep-lines of the two tests almost coincide, and that the normal drive is a little better at high slippage. In view of these results, the latter method of tests was adopted for the remaining tests.

In order to check this conclusion again, and secure more accurate results with the first two belts, the tests on J-40 and J-41 were repeated, making the quarter turn drive tests first as with J-38. Notice that the horsepower slip curves for each belt plotted from these tests on Fig. 5. are much closer together at the lower slips than in the first tests on Fig. 3.

Up to this time the comparison between the two drives had been made at the rather liberal center distance of 13 feet, which was chosen to bring the quarter turn drive well within the range of good practice. It is obvious that the angle at which the belt leaves both pulleys of a quarter turn drive becomes greater as the center distance is shortened. As a result the strain on the long edge, which takes most of the load is increased, as the center distance is decreased. Other tests at a shorter center distance bordering on the lower limit of good practice were necessary. Following the empirical rule that the center distance of a quarter turn drive should be at least five times the diameter of the larger pulley, a center distance of approximately 7½ feet for the 18-inch pulleys was chosen for the next tests.

The two leather belts J-38 and J-41, after being cut to the proper length were put on this short quarter turn drive, and run in and tested, after which the normal drive comparisons were made. The tests on J-41 followed each other directly except for an interval of time required to change over the apparatus. As more time elapsed between the two tests on J-38, with a greater possibility of error due to humidity or surface changes, the quarter turn apparatus was set up again and another test was made on this drive. These are indicated as curves 3, 4, and 5 on Fig. 6, 5 being the extra test. This completed the power transmission comparisons of the two drives.

A number of trials on different combinations of pulleys and center distances were made in an effort to find out if there are any limiting conditions of a mechanical nature in the layout of quarter turn drives. Practically any drives which could be duplicated on the apparatus would work, although at short center distances they were obviously putting a terrific strain on the long edge of the belt. In some of these short drives using a small pulley, the short edge was not in contact with this pulley at all. Instead it tended to curl away from the small pulley because of the crimping action due to the sharp lateral bend as the belt left the pulley. Obviously the belt life on such a drive would be very short, so short that belt life is really the determining factor in the use of such drives. Since it was considered inadvisable at this time to go into the question of belt life on quarter turn drives, the investigation was concluded.

An examination of the horsepower slip curves on Figs.

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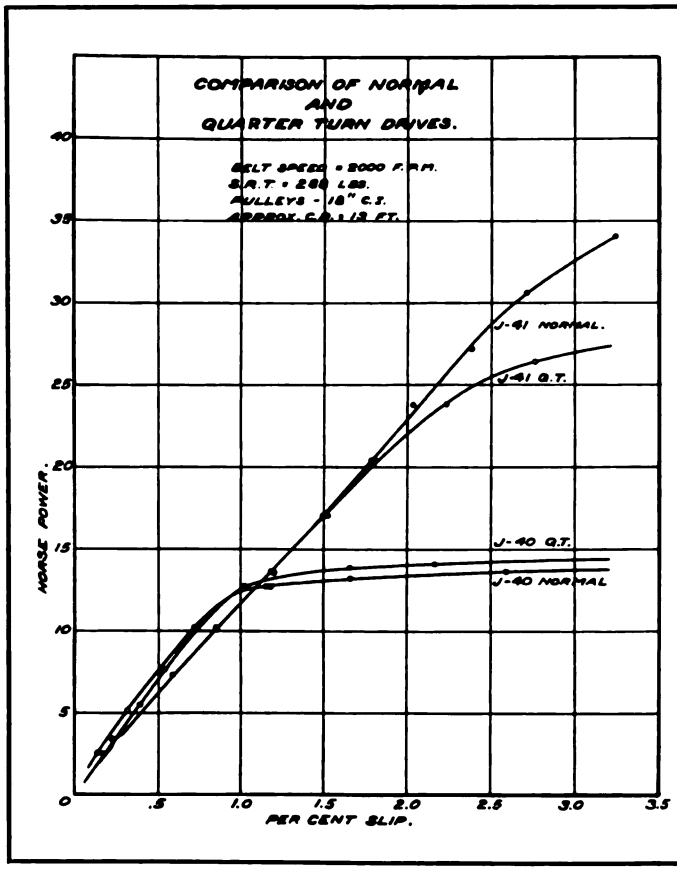


Fig. 5. Repeating the tests, as revised, on the belt first used in connection with Fig. 3, the above curves resulted.

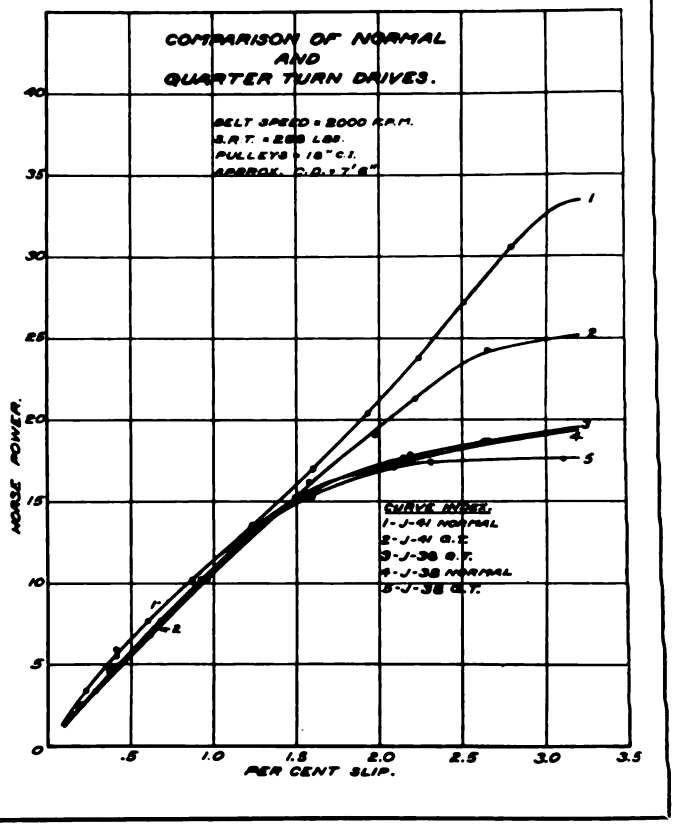


Fig. 6. Reducing the center-to-center distance, from 13 feet to 7½ feet (with 18 inch pulleys) resulted in the above curves.

3, 4, 5, and 6 reveals that with one or two exceptions, the normal drives transmitted more power than the quarter turn drive. In all tests except those on Fig. 3, the power transmitted at slips less than 1.5 per cent. was approximately the same for each drive. (It will be remembered that the curves on Fig. 3 are not considered as reliable as the others because the belts were not run in and therefore had not conformed to the quarter turn drive before the tests were made). But at slippages beyond 1.5 per cent. the curves separate and the small superiority of the normal drive is evident except in the case of J-40 on Fig. 5.

The horsepower figures in the following table were picked from the curves by using a piece of finely scaled cross section paper beneath the originals. Values of the horsepower transmitted by the normal and quarter turn drives and the per cent. difference between the two are given at 2 and 3 per cent. slips for each comparison shown in Figs. 3, 4, 5 and 6. There is so little difference between most of the curves at 1.5 per cent. that a tabulation of this data is considered unnecessary.

TABLE SHOWING COMPARISON BETWEEN THE TRANSMITTING CAPACITIES OF QUARTER TURN AND NORMAL DRIVES

			2% Slip			3% Slip		
Fig. No.	Belt	Center Distance	H.P. Normal	H.P. Q.T.	Diff. %	H.P. Normal	H.P. Q.T.	Diff. %
III	J-40	13	13.2	11.8	10.6	13.8	12.7	8.0
	J-41	13	24.9	19.9	20.0	29.3	25.3	13.0
VI	J-38	13	17.7	16.6	6.2	18.4	17.3	6.0
V	J-40	13	13.3	14.0	—5.25	13.7	14.3	—4.4
	J-41	13	22.9	22	3.9	32.5	27.0	16.9
VI	J-38	7.5	17	17.2	Av.=0	19.0	19.2	Av.=3.15
	J-38	7.5	17	16.8		19.0	17.6	
	J-41	7.5	21.1	19.5	7.6	32.5	24.9	23.4

In computing the percentage differences for belt J-38 at 7½ feet center distance the averages from the two curves 3 and 5 of Fig. 6 were used to compare with the values from curve 4 as indicated in the tables. The greatest difference between the two drives occurred with the high capacity belt J-41 at 3 per cent. slip, the difference being 16.9 per cent. at 13 feet center distance, and 23.4 per cent. at 7½ feet center. Notice that at 2 per cent. slip the per cent. differences for J-41 are much less, omitting the uncertain value from Fig. 3. With J-38, the belt of medium capacity, the differences are small, and they are greater at the longer center distances. The results from J-40, the belt of lowest capacity, indicate very little difference between the two drives as in one case the normal drive horsepower is higher and in the other case it is lower than the quarter turn horsepower, with average slightly in favor of the normal drive.

The following conclusions may be drawn from the table and curves. First, at slips up to 1.5 per cent. there is practically no difference in the transmitting power of the two drives. Second, at the higher slips the advantage is with the normal drive, especially with belts of high capacity. Third, if the center distance is within the limits of good practice, it has little if any effect on the difference between the two drives, or in other words center distance has no effect on this difference unless it is so short that the belt does not conform well to the quarter turn drive.

For the purpose of design a horizontal quarter turn belt should be from 5 to 10 per cent. wider than a normal belt, other conditions remaining the same. Under most conditions an allowance of 5 per cent. would be enough but if the drive is severe 10 per cent. would be better. It is not certain that these figures would apply to a belt much wider than four inches, but they should if the belt conformed well to the drive, and was in good contact with the pulleys most of the way across the belt.

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There is no theoretical reason why a quarter turn belt should not be able to carry as much load as a normal belt, except that the tension varies across the width of the belt. The total area of pulley contact is certain to be less because the short edge is not in good contact at certain points, but theoretically this should make no difference; practically it may have some effect. Furthermore the effective arc of contact is actually greater on a quarter turn belt than on a corresponding normal belt. A glance at the driven dynamometer pulley on Fig. 1, will explain this. It is true that the short edge of the belt does not come on the pulley as soon as the long edge, and in fact it may not touch all the way around, but it is also true that the edge which is carrying the load makes contact with the pulley throughout the entire theoretical arc of contact, which is always greater than 180 degrees on both pulleys. Therefore, the small differences indicated by the tests on the low capacity belts are to be expected. The greater difference obtained at high slippage on J-41 can be partly explained by the fact that this belt undoubtedly had a better coefficient of friction in the center than on either edge, where most of the contact on the quarter turn drive came.

In the trials of different quarter turn drives the length of the long and short edges of several were measured by placing a steel tape immediately alongside of each edge of the belt. The difference in length of the two edges varied from 13/16 of an inch to 3 inches, the latter being the difference for a 30-inch pulley driving a 6-inch pulley, at 6 feet centers. This is an impractical drive, but the belt stayed on all right although the short edge was curling and crinkling badly as it left the small pulley. A 9-inch pulley was substituted for the 6-inch, but it did not improve conditions much. At longer center distances, five times or more the diameter of the larger pulley, the long edge of a four inch belt would not be more than 1½ inches longer than the short edge.

The difference in length of the two edges is caused by the fact that the same edge has to take the outside of the curve formed by the belt as it leaves either pulley, and the stress is usually greater on that part of the belt passing through the curve at the driven pulley. The shorter the center distance for any given pulley, the sharper this curve, and the greater the strain on the belt. Since the curvature depends upon the pulley diameter and center distance, their ratio determines the maximum bend that the belt will have to make (which will be on leaving the smaller pulley). It follows then, that this ratio has an important influence on the life of the belt. Belt life being an important factor in the choice of the minimum ratio between the center distance and the large pulley diameter brings in an economic problem which can be more easily solved by a study of quarter turn belts in service, than in the laboratory.

A few remarks on points of general interest in the operation of quarter turn drives might be of some value in this discussion. In almost every instance where a leather belt was installed fairly tight, a certain amount of squeaking was present even at no load. This was caused by the tendency of the belt to slip sideways just before it left the pulleys. If the belt was under load the squeak usually originated at the side where the belt left the driven pulley, because this was the tight side and it naturally offered more resistance to sideways sliding than the loose side. In the case of the 30-inch pulley driving the six and 9-inch pulleys at 6-feet centers, the side slipping was great enough to cause bad heating of the smaller pulley.

In general, a quarter turn belt will stay on the horizontal pulley better if the horizontal pulley is used as the driver, because when it is driving the loose or sagging strand of the belt comes on to the driven pulley, which is in a vertical plane, and therefore the belt will run true regardless of the sag of the loose side. If the driver pulley is in a vertical position, the loose side of the belt feeds on the horizontal pulley, and the sag of this strand tends to make the belt run off the lower side of the pulley. When the load is variable the belt has a tendency to run in a different place on the horizontal pulley for every change in load. Tightening the belt helps to overcome this trouble, which would be experienced more or less with loose belts, at long centers, or at high speeds.

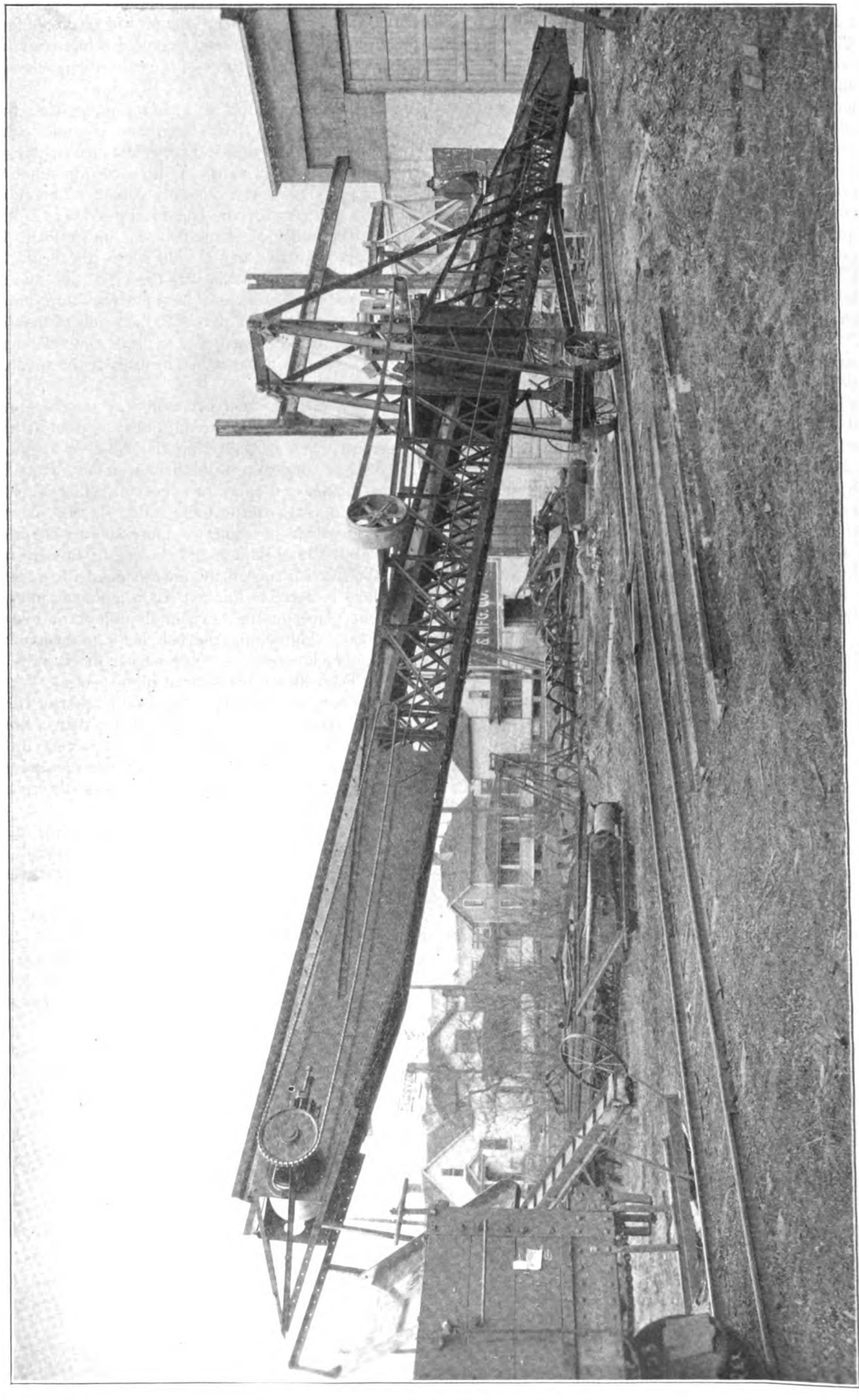
1. For the purpose of design a horizontal quarter turn belt should be from 5 to 10 per cent. wider than a normal belt, under the same conditions. There is very little difference in the transmitting capacity of the two drives at slips below 1.5 per cent. and more or less difference at higher slips depending on the belt.

2. The difference between the capacity of normal and quarter turn belts at normal slips is probably small at any reasonable center distance above the minimum used (five times the large pulley diameter).

3. Any quarter turn drive that can be duplicated on the testing apparatus will run, that is, the belt will stay on at least for a time and transmit power. Therefore the limiting mechanical conditions, such as the ratio of the larger pulley diameter to the center distance, should be determined by the life of the belt.



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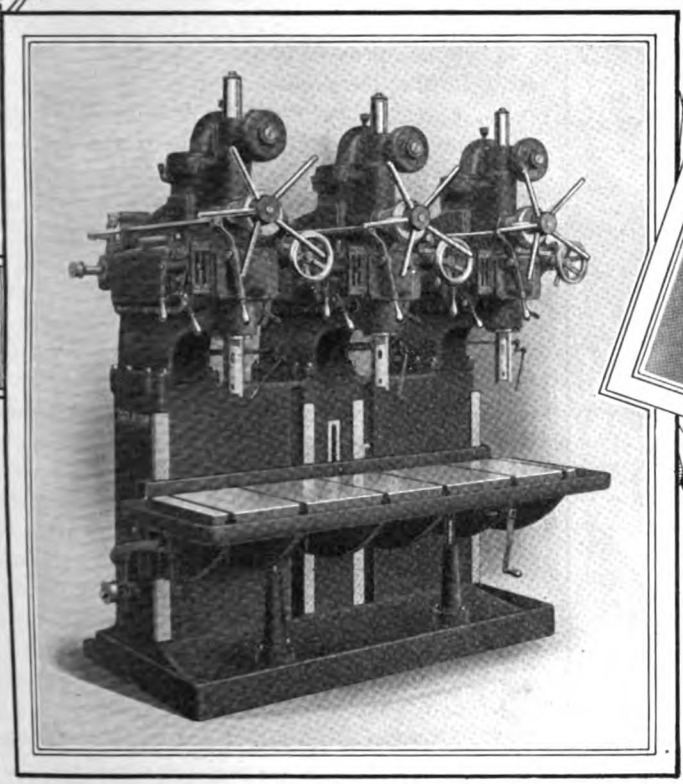


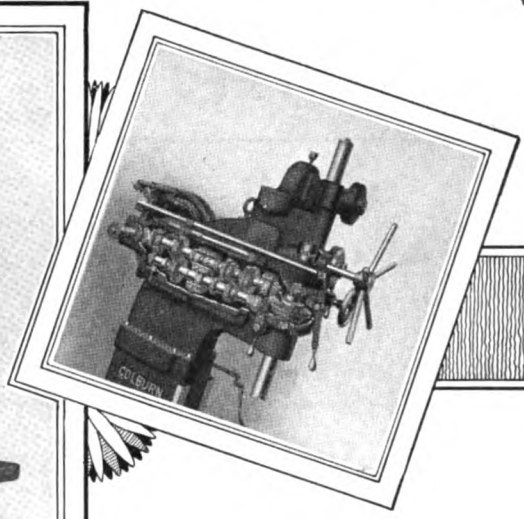
THE BIGGEST PORTABLE CONVEYOR EVER BUILT

This is a 100 ft. portable belt conveyor for use in back filling, attached to a trenching machine, and the interesting part of it is that this is actually the longest

roughly three tons per minute. The weight of the complete unit is approximately 19,000 lbs. and power is furnished by a 4 cylinder, 20 hp. motor. It is in use by the contracting firm of Hanson & Willadsen, Spring-

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The high precision quality of New Departure Ball Bearings is recognized by the makers of this heavy duty drill press. Examine the cutaway illustration and note the important parts in which New Departure Ball Bearings are used.

Get Permanent, Rigid Alignment of Gear Shafts and Spindles with New Departure Ball Bearings

GEAR shafts and spindles to which they are applied are permanently and rigidly held to the original alignment.

As New Departure Ball Bearings are practically frictionless, all of the machine power is available for production work. This means greater and more economical operation.

Machine design is simplified when New Departure Ball Bearings are incorporated. Lubrication is positive with less lubricant and far less frequent attention.

Sixteen Engineering Data Bulletins on ball bearing application to drilling machinery are yours for the asking. Our Engineering Department will gladly cooperate with your designers and make recommendations without obligation.

The New Departure Manufacturing Company

Chicago BRISTOL, CONNECTICUT Detroit

New Departure Economies Are Visible in Profits

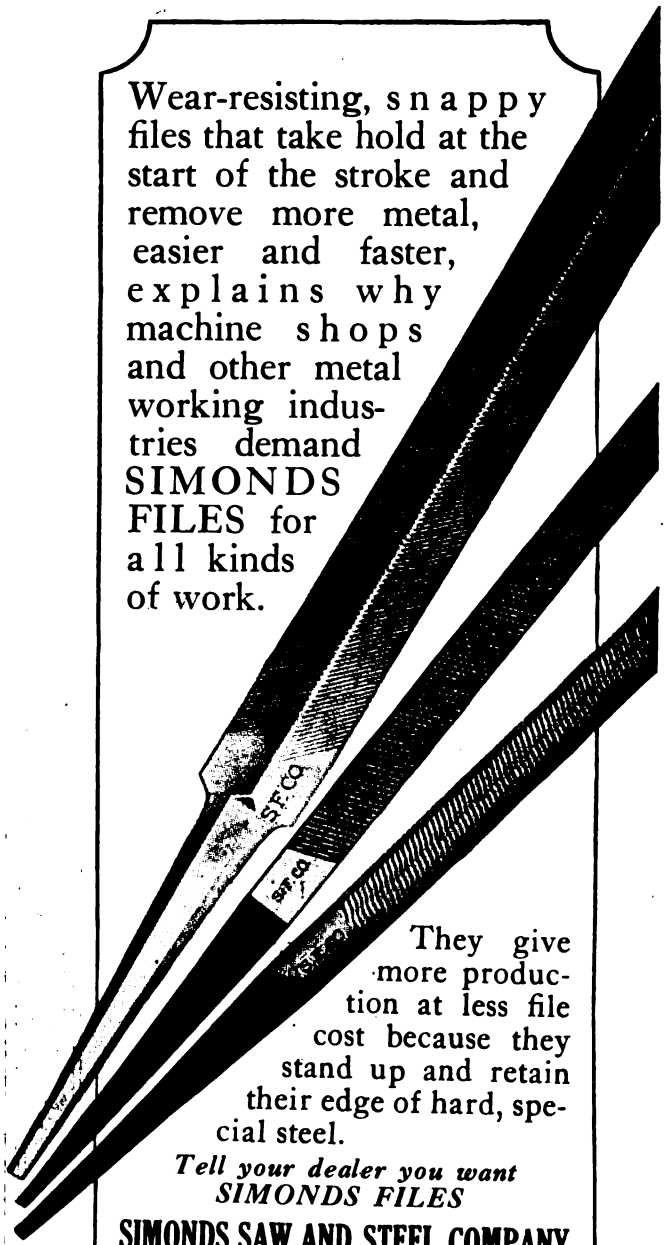


New Departure Quality Ball Bearings

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Wear-resisting, snappy files that take hold at the start of the stroke and remove more metal, easier and faster, explains why machine shops and other metal working industries demand SIMONDS FILES for all kinds of work.



They give more production at less file cost because they stand up and retain their edge of hard, special steel.

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SIMONDS FILES For Industry

(*Continued from page* 19)

In the steam cylinder an excess of a few drops over the amount theoretically required to give effective lubrication will have no material effect upon subsequent operation. Continued delivery of any material excess of oil to an air compressor cylinder, however, may frequently result in the development of objectionable carbon deposits, especially where an oil is used which tends to leave gummy residues, and where the dust content of the intake air is appreciable to any extent.

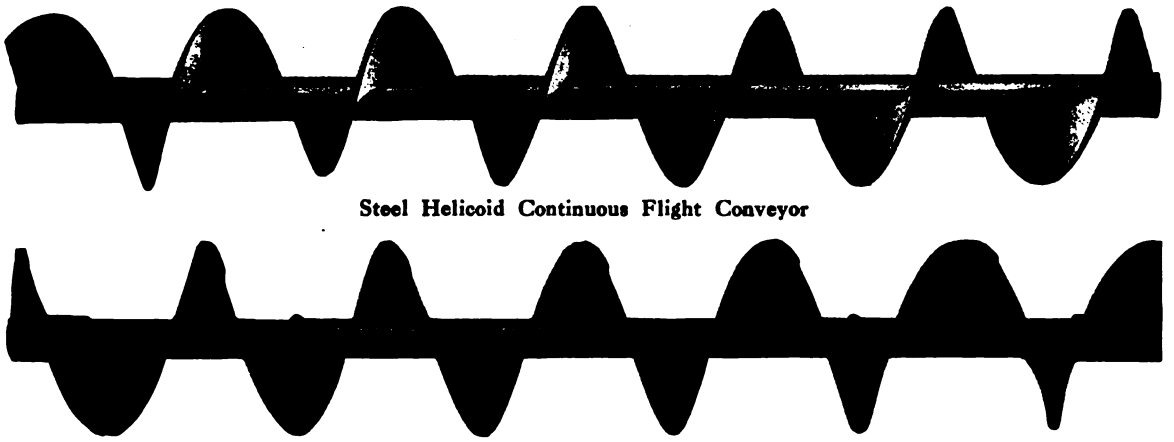
In consequence oils for air compressor cylinder service should have a low carbon residue content, an ability to function under normally high temperatures without undue deterioration, and sufficient body or viscosity to withstand such pressures as may be imposed upon the lubricating films. It is also most important to maintain as perfect a seal as possible between the piston rings and cylinder wall in every case, in order that loss in compression does not occur. The oil film is usually the ultimate factor in this regard. In other words the latter must be of suitable viscosity at the operating temperature as to adequately resist the pressure involved.

To bring this about most effectively, the oil must of course be properly applied. In certain types of compressors it will be practicable to "lubricate the air," that is, inject oil drop by drop into the air at the intake, of course, after such air has passed through the filter if one is installed. The average highly refined air compressor oil will atomize comparatively easily; on the other hand, air will not carry oil particles as readily as does steam. There will, in consequence, be a possibility of certain parts being under-lubricated. This will be especially true in regard to the top sides of pistons and cylinder walls in larger, horizontal compressors. At the same time the bottom parts may be receiving too much oil, to result in collection of residues in certain parts.

Many operators, therefore, prefer to feed the oil to the cylinder itself, using suitable means to bring this about, such as the sight feed oiler, or the mechanical force feed lubricator. The former is regulated by hand and functions irrespective of the speed of the machine. Furthermore, it must be turned on and off by the operator whenever the compressor is started or stopped. The mechanical force feed lubricator, on the other hand, after being adjusted as to rate of oil flow, operates with the machine, starting and stopping automatically. It is, in fact, more fool-proof and capable of more nearly effecting automatic lubrication.

Regarding the delivery of such lubricants, it is well to emphasize the importance of frequent and regular inspection of all lubricating equipment. Simply because an automatic device is employed which has once been set as to rate of oil flow, is no assurance that it can be forgotten. It may never fail, but if it should, considerable damage might accrue. Too much oil is practically as bad as too little, in this regard, the one promotes deposits and faulty valve action, the other, wear and ultimate loss of compression. So the operator should always know definitely just how long a lubricator full of oil will last, and should check the rate of flow regularly, noting the appearance of the wearing surfaces of the compressor at each period of overhaul.

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Steel Helicoid Continuous Flight Conveyor

Sectional Flight Conveyor—End Flights Where the Most Wear Occurs are Made Extra Heavy

Drop One of These Sections on the Floor

There's No Rattle

JEFFREY Spiral Conveyor Flights fit the pipe with a LOCK GRIP so tight that under almost any ordinary service Jeffrey Spiral Conveyors would work equally well with or without intermediate lugs. The intermediate lugs are provided, however, as an additional support for the flights. Collars on the end of the pipe provide a strong support for the end lugs and increase the effectiveness of the coupling bolts.

The spiral conveyor is especially adapted for handling bulk materials where space is limited and does not permit of a return strand of conveyor. The conveyor can be completely inclosed, an important feature where dust is a vital factor.

The cost of a Jeffrey Spiral Conveyor is low, as the trough is practically a box girder and forms its own support. Furnished in either Sectional or Helicoid Flights, 4 to 20 inch diameters.

The fittings for Jeffrey Spiral Conveyors, such as hangers, couplings, end bearings, linings, etc., are designed and made in keeping with the high quality of the conveyor itself. Complete details and prices on request.

The Jeffrey Manufacturing Company

946-99 North Fourth St., Columbus, Ohio

New York Buffalo Rochester, N. Y. Philadelphia Pittsburgh Scranton, Pa. Boston Cincinnati Cleveland Detroit Chicago Charleston, W. Va. Milwaukee St. Louis Denver Salt Lake City Los Angeles Birmingham Charlotte, N. C. Montreal

50 YEARS OF SERVICE TO INDUSTRY

JEFFREY

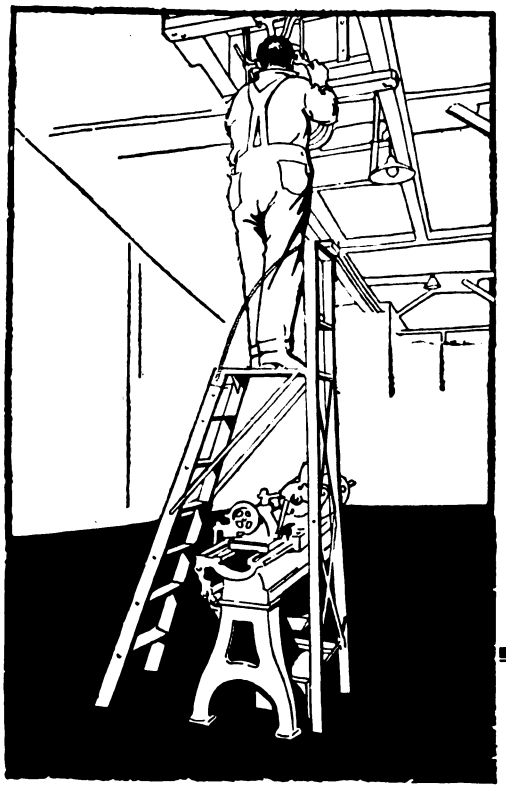
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Would You Employ One-Armed Workmen?

You are virtually doing that very thing when you ask a man to work from a step-ladder. He *knows* he's not safe—hangs on or steadies himself with one hand. You pay for the work of that hand—why not get it? The Dayton Safety Ladder can't slip, sway, wabble, slide or collapse. The wide leg-spread, broad platform and safety rails provide absolute security. There is no time wasted in needless ladder adjustments or in running up and down for tools. Dayton can be placed over machinery or close to the wall. Its use is a profitable investment in better, faster work, and in positive accident prevention. Made from steel braced aeroplane spruce in sizes from 3 to 16 feet.

Write for full information

Dept. I. 3

The Dayton Safety Ladder Co.

121-123 W. Third St., Cincinnati, O.

(*Continued from page 24*)

two selector switches, one from the main and one from the auxiliary bus, connecting two feeders.

The bus is protected from any incoming or outgoing short circuit by two switches in series and bus ties are provided with duplicate switches and reactors. Reactors are also provided for each generator and each feeder. The neutral of the system is grounded by means of zig-zag transformers from each bus. The generators are protected by a differential relay between phases and by balanced relays between parallel windings of the same phase.

The selector switches for both feeders and generators are of the explosion chamber type, with a rupturing capacity of 1,500,000 k. v. a.

The busses are built up of 5½ x ¼ in. copper strips in groups of three separated by ¾-in. of asbestos and insulated with 30 wrappings of cambric, well shellacked. The entire switchboard galleries have forced ventilation and the apparatus has the usual concrete compartments with transit board doors and the usual safety devices.

All of the duct work has been constructed in concrete, with rubber forms, which leave a smooth duct with no internal joints or excrescences to tear the lead sheath of the cables.

The control gallery is at the east end of the operating room, where the usual generator and feeder boards are installed with all instruments and relays.

The station feeders are carried out as single conductor, lead covered cables directly from the disconnecting switch to the first manhole; here they are spliced to similar single conductor cables and carried to a bifurcation point, where each feeder is split, half going to each of two substations, where they are connected individually to 4200 kw. converters.

While all of the generating portion of the station is located on the long lot on the north of Fourteenth street, the bulkhead for about 800 feet, between Thirteenth and Fifteenth streets, will be available for the handling of coal from the steamers to the coal storage or to the station.

The raw coal bunkers will have a capacity of about 8,000 tons of coal, while the pulverized coal bins above the boilers will carry sufficient coal for a ten-hour run.

South of the mill house the remainder of the lot is devoted to coal storage, with a capacity of about 50,000 tons.

With this system of coal handling machinery, a 10,000 ton steamer can be unloaded in 10 hours, and sufficient storage in the buildings is provided to tide over any disarrangement or accident to the coal handling machinery.

Erratum

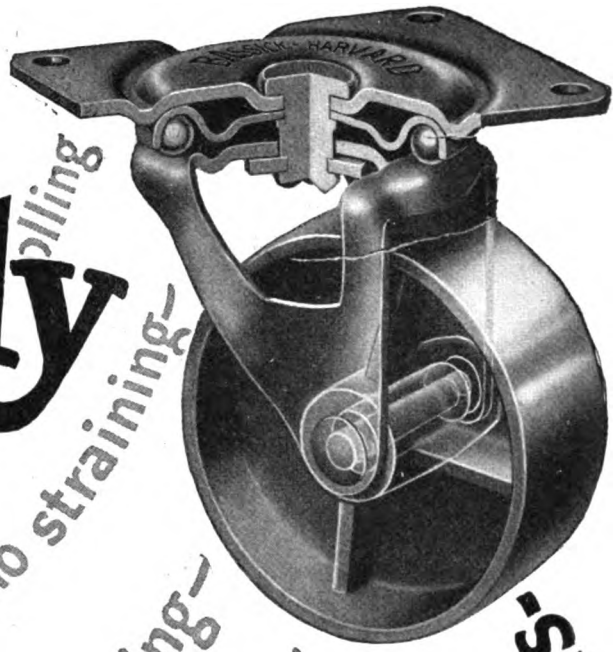
ON page 82 of the December, 1926, issue of INDUSTRY ILLUSTRATED, in a description of the type EP 10 lift truck, manufactured by the Elwell-Parker Electric Company, Cleveland, the statement was made that the storage battery compartments of the trucks were designed to accommodate up to a 30 A8 or 18 cell 21 plate Ironclad battery in place of the Edison cells formerly used.

The announcement should have read that the battery compartments were designed to accommodate either the Edison battery or the 30 A8 type 18 cell 21 plate Ironclad battery.

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no straining safely -quietly- saves floors

-and quietly



BRUTES for work —Bassicks roll into the toughest job and see it through—easily—smoothly—safely—and with a gentlemanly regard for load—and floors.

Bassicks are dependable —always. Correct in design—built for long, hard service—and over a range that includes every specific caster need.

-How easily it rolls on Bassicks-

quiet—saves floors—easy rolling—no straining—easy roll

BASSICKS
Harvard Steel Ball-Bearing Truck Caster

Heavy gauge steel construction. Sturdy ribbed iron wheels. Embossed top plate reinforced by independent ball cup—gives double thickness of metal and double strength at vital points.

Lapped ball bearings. Specially annealed, extra heavy king pin.

Spanner bushing riveted solid between forks of horn protects axle, strengthens horn, prevents its bending inward under weight and binding wheel; gives larger bearing surface for wheel with resultant longer life. [Bulletin No. 104 F on request]

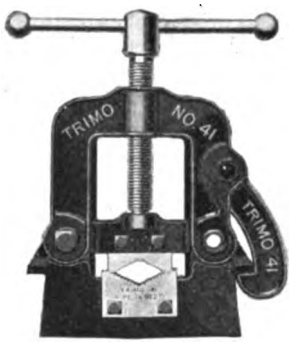
Bassick Casters
THE BASSICK COMPANY
(A Division of Stewart Warner)
Bridgeport, Conn.

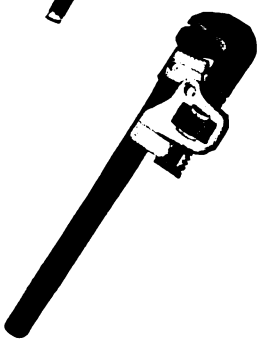
For thirty-one years the leading makers of Better Casters for home, office, hotel, hospital, warehouse and factory.

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TRIMO







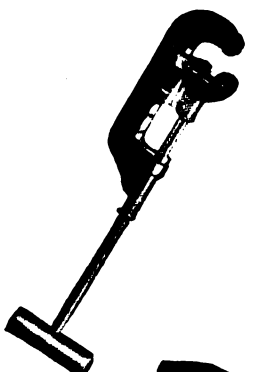
Trimo Tools *are* RUGGED

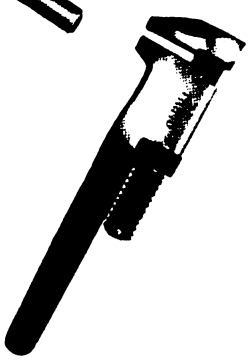
We jealously safeguard the reputation of the TRIMO name. Every TRIMO tool must be capable of not only standing the grind of day in and day out toil,—but must meet the emergencies when unusual strain or effort is called for.

To ensure this, each TRIMO tool is rigidly tested after each manufacturing process.

Because they are built to "stand the gaff," TRIMO tools are the most economical—doubly so as there are replacement parts for every tool.

Sold by mill supply dealers.





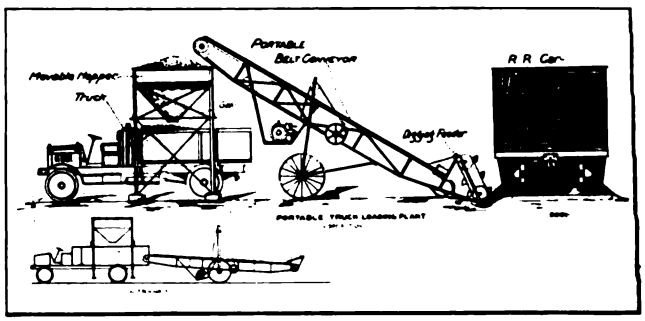
Trimont Mfg. Company

Roxbury (Boston), Mass.

America's Leading Wrench Makers for Nearly Forty Years

A Portable Truck Loading Plant

THE introduction of demountable and movable batch hoppers for expediting contracting work has led to the development of a portable truck loading plant. This consists of a motor truck, a movable hopper and a portable belt conveyor. The hopper is located adjacent to the supply track within reach of the conveyor discharge. Cars of sand, gravel or stone are unloaded through the hopper gates onto the ground. A short bucket elevator feeder picks up the material and discharges to the belt conveyor, which in turn loads the hopper. Trucks are loaded through a gate in the bottom of the hopper. The conveyor and feeder are mounted on a structural steel frame carried by heavy agricultural type steel wheels.

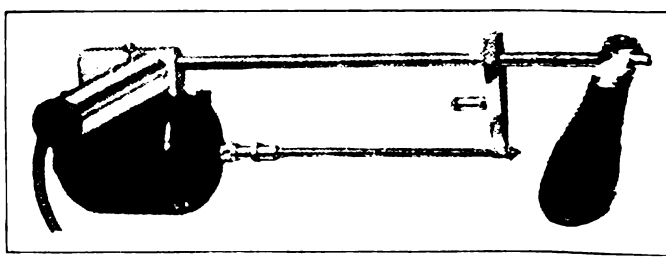


When a portion of the work is completed the hopper is loaded on the truck, and the conveyor is attached at the back of the truck as a trailer, to be transported to the next location.

Mica Undercutter Saves Labor Costs

AN electrically operated portable mica undercutter, which it is claimed will undercut any commutator in one-tenth the time required by using hack saws or files and save 90 per cent. labor costs, is being manufactured by the Hullhorst Micro Tool Company of Toledo, Ohio. One of its exclusive features is the use of a small cutter only 9/32 in. in diameter, which facilitates great ease in guiding and cutting commutator mica.

This undercutter is sturdy and compact in construction and simple in operation. It can be operated by an unskilled man at a rapid speed. It is said an inexperienced



workman can undercut mica with this machine at a speed of 100 to 200 feet an hour when undercutting a depth of 1/32 in. The width of cut depends upon the thickness of the cutter.

This mica undercutter is driven by a Westinghouse motor and can be operated from any ordinary light circuit of 110 volts by means of the attachment cord plug. It is easily carried from one place to another by means of a case supplied with a leather handle.

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THE past three years have seen more radical improvements in pipe-threading practice—thanks to Oster engineers—than any similar period—improvements in speed, ease and economy.

Is your pipe-threading up-to-date? Send the coupon for the latest Oster Catalog and find out.



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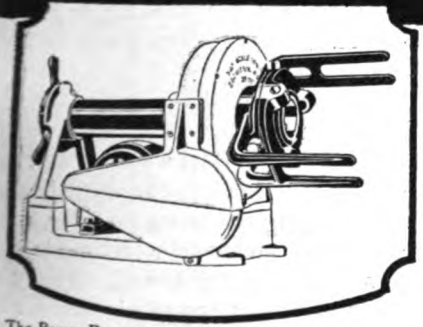


Power Machines



Bull-Dog Die-Stocks

OSTER



The Power Boy "Motorize Your Stocks and Dies"

The pride of Oster's 33 years of concentration on pipe-threading is the Oster Power Boy—a husky young portable electric threader and cutter of ½" to 2" pipe, that weighs only 150 lbs. Gets his energy from a light socket and you never saw such a willing, tireless worker—a real money maker. He will keep busy every minute of the day and then do overtime without complaint. For details write to The Oster Manufacturing Company, 2058 East 61st Place, Cleveland, Ohio. Manufacturers of the most complete line of pipe threading equipment in the world.

The OSTER MFG. CO.
2058 E. 61st Place
Cleveland, Ohio

Please send me a copy of the latest OSTER catalog. I am especially interested in

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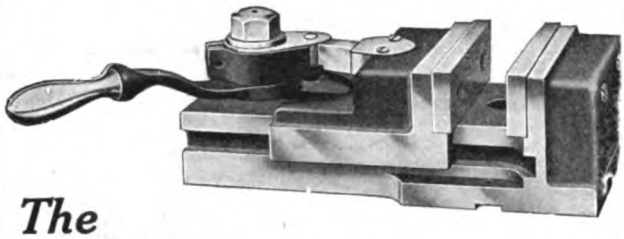
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Quick Operating and Wide Opening Lever Vises

Made in Three Sizes

No. 1—6¼" long—8 lbs.....$50.00
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Prices Subject to a Discount of 45%

A slight movement of the lever and the jaws close with a grip of steel. This is just what you need where a great many pieces must be handled and handled quickly.

Designed for Milling and Drilling Machines

"PRONTO" Quick Operating and Wide Opening Lever Vises are made in the sizes shown. Write for descriptive circulars.

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Time resisting Liquid Armor that spreads like Paint



On those places where corrosion quickly eats away other surfacing compounds—use NITROSE. It resists the action of acids, chemicals, heat and cold. Hot piping, boiler fronts, engines, stacks and all hot equipment can be protected by NITROSE. It costs less by saving labor, and lasting longer. NITROSE is the time-rust-acid-heat-and-cold-resisting liquid armor that corrosion can not eat.

You'll find it a pleasure to protect with NITROSE—because you won't have to do it again for a long time to come.

Wherever heat, rust, gas, grease, chemicals, acid fumes, brine solutions, ammonia and alkalis attack metal—NITROSE forms an armor that conquers corrosion.

Put it on with no more preparation than wire brushing the scale; spread it over wet, oily and hot surfaces; use only one coat. Do no mixing and use no primer. Write for more facts you really should know before you RE-paint.

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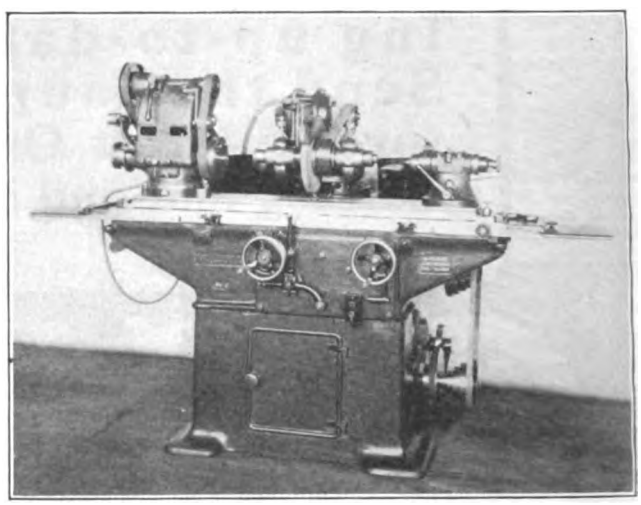
NITROSE

New Motor Drive for Universal Grinding Machines

THE accompanying view of a Brown & Sharpe Universal Grinding Machine illustrates clearly the manner in which these machines become completely self-contained and independent units when equipped with motor drive, requiring no more floor space than the same machines when driven by belt from the main line.

Power for the headstock drive, for the wheel spindle drive and for the table feed drive on each machine is supplied by three individual electric motors. The three motors are controlled by a single push button switch located at the front of the machine near the controls and within immediate reach of the operator. "Burning out" of the motors through overloading is prevented by means of protective plugs located in the magnetic switch control box, which is mounted on the base casting at the rear of the machine. Any motor not needed may be cut out by removing one of these protective plugs from this switch.

The method of taking the drives from the motors may be readily noted. Three balanced motors—installed with



regard to power, convenience, and protection—permit the marked flexibility and the high quality of grinding for which these same machines equipped with overhead works have long been known.

The motors are amply protected yet readily accessible and in advantageous positions for the efficient delivery of power to the operating parts. The work driving motor is mounted on the headstock which is compactly designed and has provision for driving the work on either live or dead centers by means of an efficient arrangement of belts, pulleys, idlers and belt tighteners. The wheel spindle driving motor is firmly mounted on the wheel stand which is bolted to the wheel stand platen. The drive is direct from the motor pulley to the spindle pulley except when the internal grinding attachment is used. In this case the spindle is replaced by a countershaft through which the drive is taken to the attachment mounted on the platen which has been placed in the reverse position. The motor for providing power for the automatic table travel and cross feed is located at the rear of the machine. This motor also drives the pump which provides an abundant supply of water for wet grinding.

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Across-the-Line Starters

built to "the standard of millions"

NOT thousands, not hundreds of thousands—but *millions* of operations—this is the standard to which Cutler-Hammer engineers designed the new line of C-H "X" (Across-the-Line) Starters.

Month after month these new designs were kept under gruelling tests—given years of service in weeks of testing. As failures occurred, part after part was redesigned, retested, redesigned, and again retested until they met "the standard of millions."

This standard, C-H engineers maintain, alone insures the dependability in service which industry has come to expect of Motor Control that carries the C-H trade mark. It assures unfailing performance—eliminates delays—saves in maintenance.

C-H "X" Starters are built in four sizes for connecting A. C. motors up to 75 horsepower across the line. Their many features of construction are worthy of your investigation. Write for full information.



Specify "Cutler-Hammer" on your purchase orders. Full information as to sizes and ratings, if not now in your files, will be quickly supplied on request.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electric Control Apparatus
1265 St. Paul Ave., Milwaukee, Wisconsin

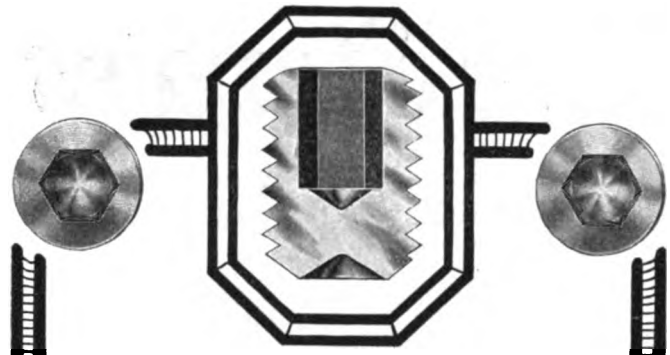
Thermal Overload Protection

Far superior to the magnetic type of overload, the Thermal Overload Relay on C-H "X" Starters cuts the motor from the line only at dangerous temperatures. By simply changing the heater coils, the same starter without compromise can be adapted to any size motor up to maximum capacity.

CUTLER C-H HAMMER

Industrial Efficiency Depends on Electrical Control

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Experience

Experience writes the specifications for Hollow Screws. It doesn't care who makes them.

All makes, all styles of Hollow Screws have had their years of test. Time has settled the merits of socket-design and fabricating process.

Today's chief "argument" for ALLEN Screws is found in most all machinery in all industries. It's found in the fact that the machinery runs without breakdowns from hollow screws.

Cold-drawn sockets, 30% greater strength. Clean, true hexagon holes; firmest leverage for the wrench. Special-analysis alloy steel; special heat-treating for different-style points and diameters.

Experience has written the specifications; we execute them.

The Allen Mfg. Co.

127 Sheldon St., Hartford, Conn.

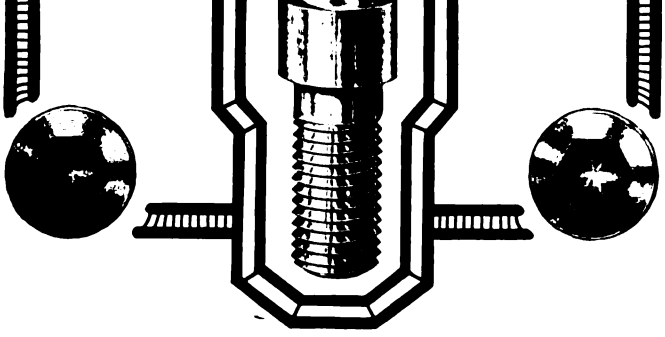
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For produc *in this issue write Industry Illustrated*

Industrial Psychology in England

COMPLIMENTARY references to the work being carried out in the United States to apply psychology to industrial problems are contained in the first of a series of studies on occupational analysis that have just been sent to members by the National Institute of Industrial Psychology, of which the Earl of Balfour is president.

It is pointed out that in all countries in which vocational guidance is receiving public attention the general development during the last twenty years has been remarkably similar. In England there is no name recognized for the person who advises and places in employment a child when it leaves school, whereas in America "counsellor" is now in common use to describe a person whose special duties are those of giving advice upon choice of occupation.

It is confessed that in England owing to disorders caused by the war, development has not been rapid. At present rather less than half of the British local authorities undertake the responsibility for advising and for preparing courses of training full-time or half-time.

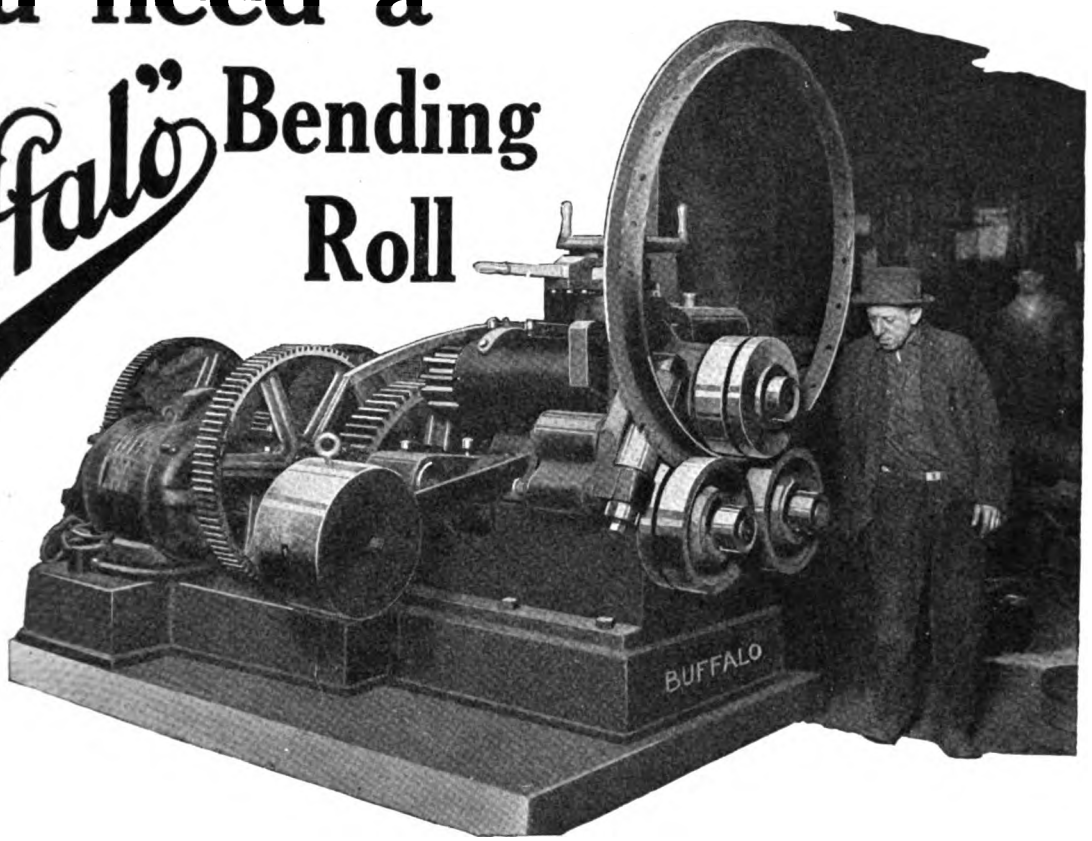
Nevertheless, the detailed enquiry already carried out has shown that in England detailed occupational analysis is of practical value. The vocational adviser has first to obtain a fairly accurate estimate of the capacities of the boy or girl who seeks his advice. He will then consider which of many occupations is likely to provide the best opportunities for success. It has been found that in advising a child concerning his future it is often more helpful to state the kind of process he ought to seek, with examples of the occupations in which they are to be found, naming the alternative, rather than to select definitely one particular occupation. For example, a child may be advised to seek work in which intelligence, good memory for figures, ability to write and calculate well, attention to detail, care and conscientiousness are essential qualities. Such work is obviously to be found in many businesses and factories. A choice from several will therefore, chiefly turn upon opportunity, personal taste and prospects.

The experiments in vocational guiding in England are being supported by a grant from the Carnegie United Kingdom Trust. Companies of Girl Guides, and Troops of Scouts are asked to send up children for tests to be carried out. Furthermore, experiments are being made in London's elementary schools. In order to help stupid more the round peg to be placed in the round hole, various education committees, notably in Kent, Leicester and Birmingham, have prepared special pamphlets describing different trades, giving general conditions, the courses of training desirable and the physical requirements of the work. Considerable advances have, in fact, been made in the British attitude towards occupational study, though it is fully recognized that in the United States there is more accumulated knowledge of the psychological aspect of industrial processes.

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Do you *bend* metal?

—you need a "Buffalo" Bending Roll

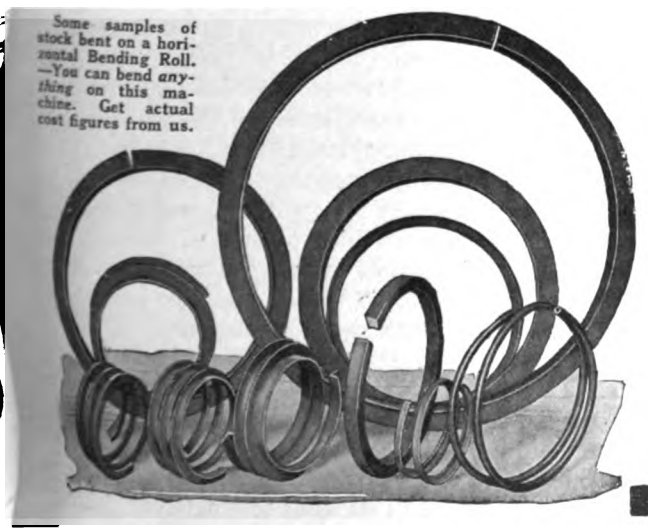


This shows the vertical Bending Roll, hundreds of which are in use—saving thousands of dollars every day.

We also make a horizontal type roll—ask for bulletins describing both.

If you bend angles, flats, tees, squares, rounds, copper tubes, steel pipe, channels, I-beams or special shapes—you can bend them more accurately on a Buffalo Bending Roll. Each bend will be handled quicker and easier, and the cost of bends will drop to an almost unbelievable figure.

Users tell us that the machine pays for itself in less than a year and it enables them to handle two or three times as much work.



Some samples of stock bent on a horizontal Bending Roll. —You can bend *anything* on this machine. Get actual cost figures from us.

If you will let us tell you how little it costs to bend stock on a Buffalo Bending Roll—you can decide easily whether or not this machine belongs in your shop.

Ask for Bulletin 317-B.

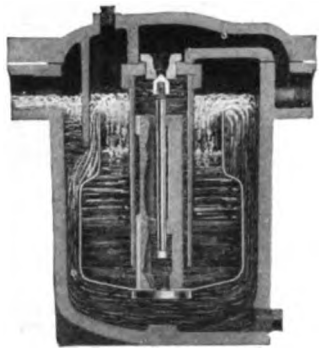
WRITE OR WIRE FOR PRICES

Buffalo Forge Company

440-486 Broadway, Buffalo, N. Y.

In Canada — Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

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ILLINOIS Eclipse Steam Trap

Shipped Prepaid on 60 Day FREE Trial

The Eclipse is not "just another steam trap." Its valve action makes it the OUTSTANDING Steam Trap of the Day!

No Other Trap Has This Feature

The valve action is SNAP action. It is either tight closed or wide open. Never cracked on seat. Wire drawing impossible.

Other Features: Can't blow steam or air-bind. No complicated levers—only TWO moving parts.

Engineers, if *you* have a "worst service" *that's* the place to put an *Eclipse* Trap for a test!

Under ordinary conditions most any trap will operate reasonably well for a while, but—it is the severe condition—the *worst service*—that shows how an Eclipse will end your trap troubles.

This coupon brings prepaid an Eclipse Improved Steam Trap for 60 day free trial.

MAIL IT TODAY

ILLINOIS ENGINEERING COMPANY
21ST AND RACINE AVE., CHICAGO

Please ship prepaid an ILLINOIS Eclipse Trap for 60 day free trial. It is understood that this is to be of *no* expense to me and that after testing the trap I may return it WITHOUT QUESTION.

Size of pipe connections .....Trap capacity.....

Maximum steam pressure .....

Firm .....

Address .....

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Signed .....Position .....

☐Send trap bulletin only.

REPRESENTATIVES IN 40 CITIES OF U.S.A.
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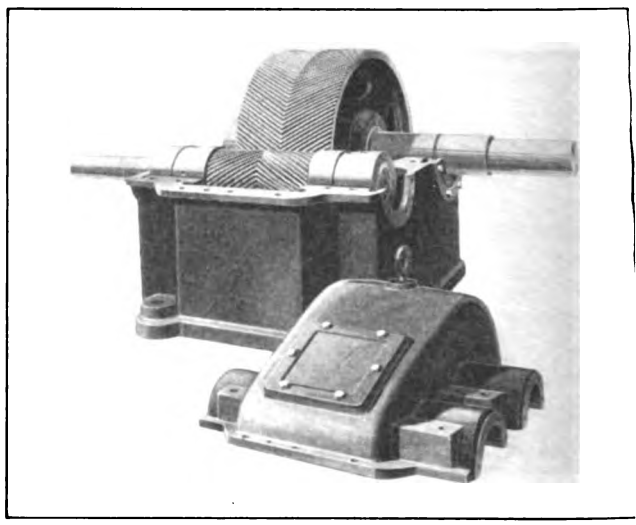
James Herringbone Speed Reducers

THE D. O. James Company is now manufacturing speed reducers, using herringbone gears, for reduction ratios from 2 to 1, to 150 to 1, and able to carry loads of 2 hp. to 200 hp.

It is stated that in the continuous tooth herringbone speed reducers the herringbone gears embody the double helical principle, giving a result similar in appearance to the joining of two single helical gears having opposed helix angles. Thus each individual tooth is brought to an apex and has the shape of a completed "V," the tooth being in no way broken and the apex not rounded to provide for tool clearance as in the common herringbone tooth gear with the gutter down the center. The minimum loss of face width from either the gap or rounded apex is equal to the circular pitch.

The individual tooth is generated, it is claimed, with a curve or twist which comes in to present the same profile in the normal (right angles to the helix angle) and to the diametral (right angles to the face) planes of the gear. This denotes the accuracy of the tooth in every respect and is made possible by a special gear generator and cannot be accomplished by the old style of hobbing process of cutting herringbone gears.

The teeth are cut involute with 20 deg. pressure angle and 30 deg. helix angle with an addendum of 0.8 over the d. p. and a dedendum of 0.1 over the d. p. This



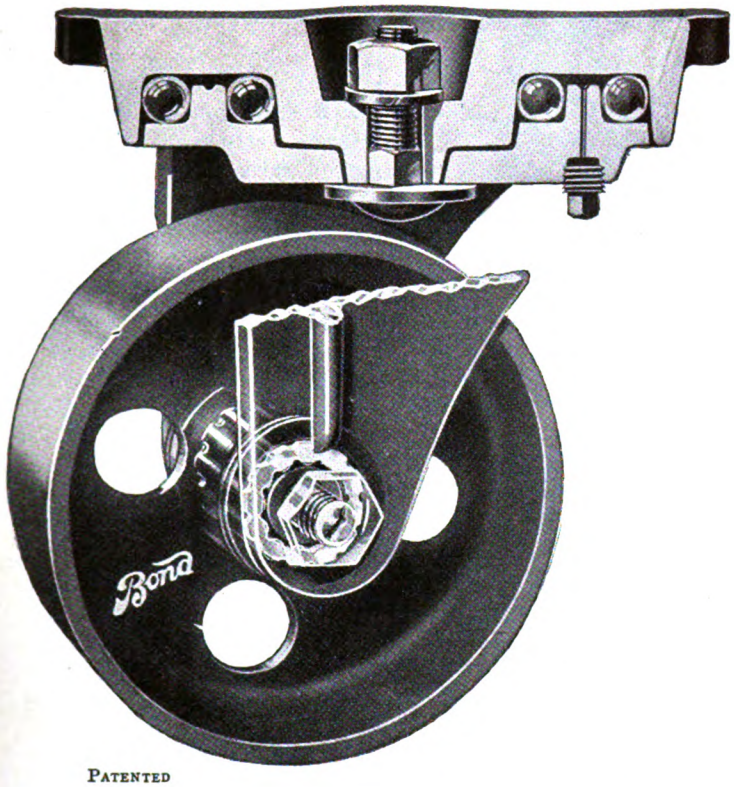
cutting at a helical angle of 30 deg., heretofore thoug not easily obtained, with the tooth coming to an ap results in the neutralization of end thrusts in the tee End thrusts are the chief objection to single helical gea The foregoing features of herringbone gears, especia of the James type, it is said, makes an overlap of appro mately 50 per cent., or approximately 50 per cent. grea number of teeth in contact at one time. (Complete ov lap is obtained when the face width is equal to or grea than 3.47 times the circular pitch). This overlapp tends to make the action continuous, smooth and no less, because there are no shocks when the load is gi from one tooth to another succeeding one.

There are two teeth always in mesh in the plane axis. The teeth are of greater strength, having a do angle and allowing for the load to be distributed the full width of the tooth. Consequently, with the ringbone gear, great loads can be carried by small g with high efficiency. This leads to a number of featu

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Bond is Best



PATENTED

Bond Truck Casters

WHEREVER there are things to be kept moving through the plant, Bond Truck Casters will carry them—tirelessly, day in, day out. Strength for any load and minimum friction are part of the make-up of every Bond Caster.

There are Bond Casters specially designed for every conceivable kind of duty. Doubtless there is a type perfectly adapted to your use.

May we show you how Bond Casters can speed up production in your plant?

Bond Foundry and Machine Company

Manheim, Pa.
New York Office: 256 Broadway
Philadelphia Office: 617 Arch St.
Chicago Office: 39 S. Clinton St.

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La Salle No. 2 Automatic Surface Grinder

This machine is particularly efficient on a wide variety of small tools. It is indispensable for grinding dies and punches and finishing bright true surfaces and parts of tools, instruments, etc.

Ease of operation, unusual rigidity, preserved alignment and long life are leading characteristics of this profitable tool.



Capacity
20"x6"x10"
24"x6"x10"

Also Manufacturers of

No. 1 Plain and Surface Grinders.....$115.00
No. 2 Automatic Surface Grinders..... 550.00
No. 3 Plain and Surface Grinder..... 365.00
American Twist Drill Grinders..Price $120 to $350
All prices F. O. B. La Salle, Illinois

May we send you full particulars?

LA SALLE TOOL COMPANY
OTTAWA, La Salle County, ILL., U. S. A.

Parks shipping room saw *at a lower price!*

was $75.00
NOW $60.00
without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

The Parks Ball Bearing Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

FILL OUT AND MAIL THIS COUPON—NOW!

I. I.
The Parks Ball Bearing Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.

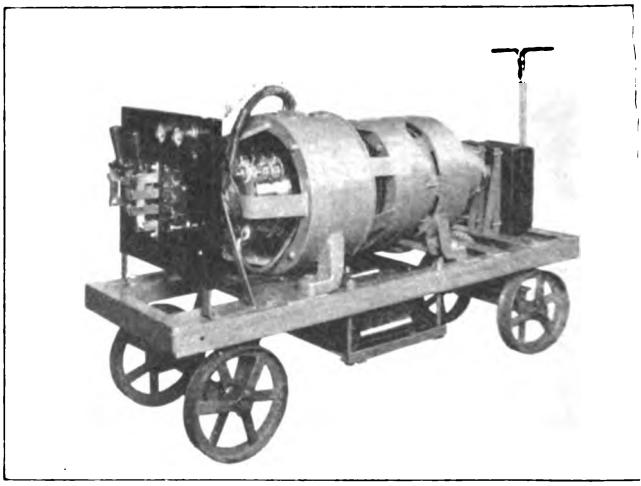
You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.

Name .....
Firm Name .....
Address .....
City..... *State*.....

such as greater reduction ratios and high rim speeds (several teeth safely meshing), longer life (less shock vibration and friction), less power consumed and less space required because fewer gear reductions are necessary. Also backlash and play are practically eliminated. All of these characteristics have special application to speed reducers and were influential in causing the D. O. James Company to adopt the type.

Arc Welding Machine Made of Welded Steel

AMONG the many interesting developments in the machinery building field is the substitution of welded structural steel in place of gray iron castings. The 300 ampere alternating current power supply Lincoln Electric Co. Arc Welder ilustrated shows the welded steel idea carried out to its logical conclusion. There are only two gray iron castings weighing about 15 lbs. total on the outfit which have not been replaced with welded steel construction. Other sizes and types are being changed over to the steel construction as rapidly as possible. The motor and generator end rings, brackets and connecting ring are all made of structural angles rolled into the proper shapes and welded together. The feet of the motor generator set are made of drop forgings. The truck wheels are made of T-sections rolled on a special machine. The hub of the wheel is made of steel tubing. Contro



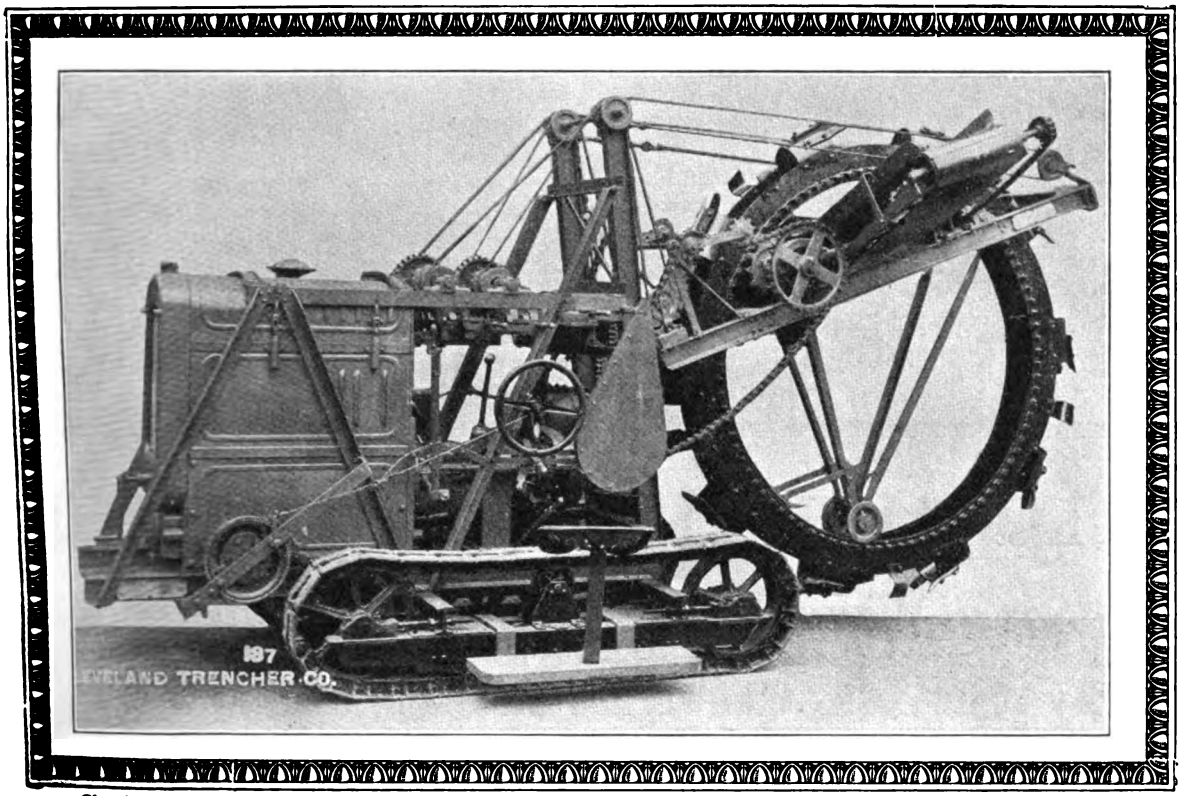
panels are usually made of slate or special non-meta compounds, but the panel illustrated is made of st steel welded together and welded to the supports.

The underlying idea in the application of the princi of welded steel construction to this arc welder wa meet the severe conditions to which portable welc equipment is subjected. Failure in operation of a w ing machine is, in many cases, a serious matter. claimed that the steel construction, due to the fact it will bend rather than break, reduces the liabilit failure for the reason that the bent parts may be stra tened and the equipment put in operation without ing for replacement castings. In several cases, the trol panel has been crushed with instruments and swi wrecked. However, the equipment was repaire straightening the panel and switches and put into ation within an hour without the instruments.

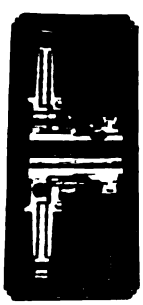
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TWIN DISC CLUTCHES



Cleveland Trencher Company "Baby Digger" trenching machine equipped with Twin Disc C-8 Clutch.



POSITIVE in action, yet built so they can be slipped if necessary without heating or undue wear, Twin Disc Clutches prolong the life and increase the working capacity of any machine that has to operate under widely varying load and service requirements.

Consult with our Engineering Department.

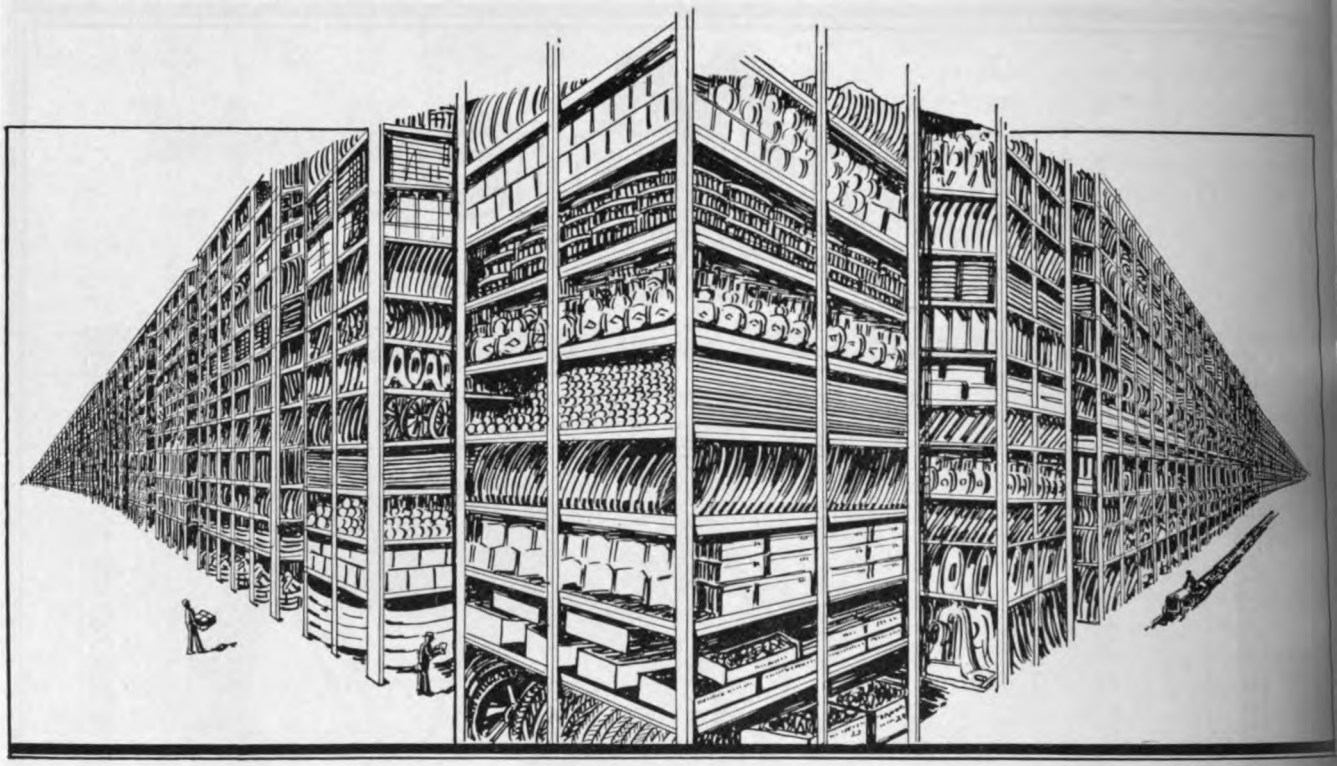
PARTS STATIONS

San Francisco—F. Somers Peterson Co., 57 California St.
Los Angeles—Coast Machinery Corporation, 406 E. Third St.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Ave.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.
Tampa, Fla.—Motive Parts Co. of Florida, Inc., 708 Twiggs St.
Detroit—Whitney Brothers, 6464 Epworth Blvd.
New York City—E. George & Co., Broome & Wooster Sts.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie St.
Cleveland—James R. Howell, 6715 Quimby Ave.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.
Buffalo, N. Y.—Edward W. Rode, 45 A St.

TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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THE LOCAL MILL SUPPLY DISTRIBUTOR

Saves Warehouse Expense and Maintenance

SUPPOSE you were to stock parts, tools, machinery and supplies for production, transmission, maintenance, power, etc., needed for the entire year?

Think what an enormous amount would be necessary! The warehouses to stock all these items would, in some cases, be equal to the floor space of your entire plant. And the men necessary to keep these items in order and to check stock and inventory would mean a considerably increased payroll.

The local mill and machinery distributor now cuts down a large part of this needed warehouse space, but, he can save a great deal more of it for you. He can furnish you with practically every item necessary at a moment's notice. Why not let his shelves act as your warehouse? That is what he is in business for.

This is one of the functions of the service that the local mill and machinery distributor is ready to render.

Buy from the Local Machinery and Mill Supply Distributor.

One of a series of advertisements published in the interest of a better understanding between the industrial [illegible] and the mill supply distributor

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The Superintendent Speaks



on a matter of unit costs

"Why did I hold up this requisition for high speed steel taps? Do you know what they cost? Well, thirty-five cents each over what you've been using—a cool 70% extra."

"Look at these figures. What if these new taps do cost more? We can handle the new production schedules without buying the extra machines we talked about yesterday, because we can speed up our present machines if we use these high speed steel taps in them. Which will it be, a few dollars more for taps or seven $2300 machines?"

"You win, Bill. Say, when did you get all that dope on taps, anyhow?"

"Oh, a GTD salesman was in here last week. He certainly is on the job and what's more I'm trying out some of his ground thread taps on two jobs, and it looks as though we'd standardize on them for certain classes of work."

—And so it goes—

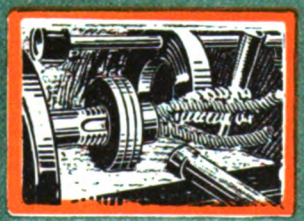
High Speed Steel tools are changing shop practices everywhere.

(Continued on next page)

Tool Sellers!

Buyers will read this advertising (the first of a series) in technical papers this month. There is profit for you in handling G.T.D. tools.

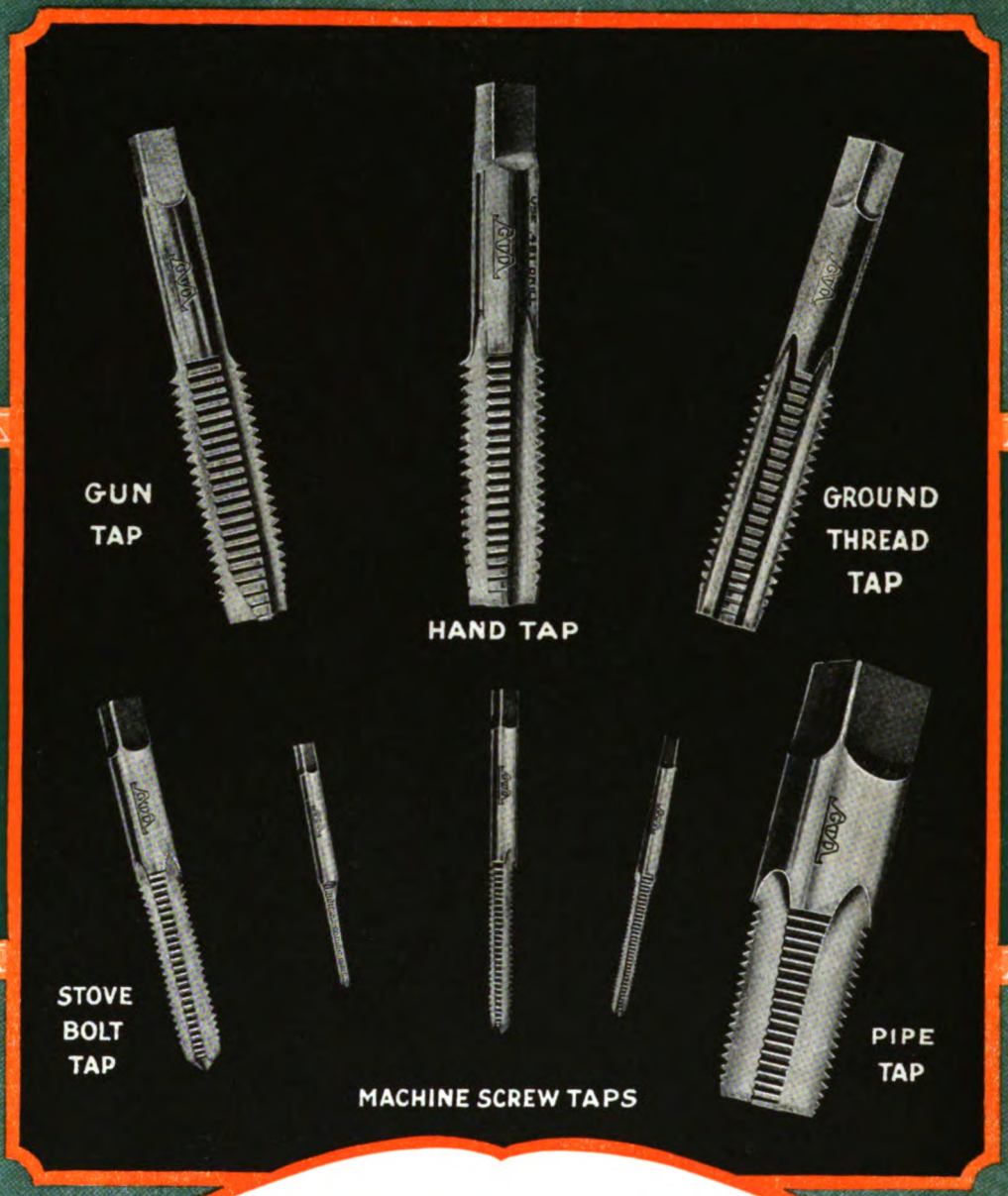




REG. U.S. PAT. OFF.

GTD

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(Continued)

Not long ago only the big shops used High Speed Ground Thread Taps. Now the wide-awake small shops are realizing what can be done with them. They are getting the same benefit of lower costs that their big competitors are. That means they can quote low enough to stay in business and make money.

Our business is your business—to help you find ways to cut the corners, to turn out better work—to save on cost and add to Profit. GTD cost-reducing tools are stocked by leading supply houses in every city and at GTD factory branches in New York, Chicago, and Detroit. Ask your dealer for information or write direct.



Come to Headquarters!

- ☐ Catalog listing 20,000 small tools.
- ☐ The Profit Angle of Small Tool Buying.
- ☐ Selected Tool Performance Bulletins.
- ☐ Who handles your line near me?

Send me without (Check thos

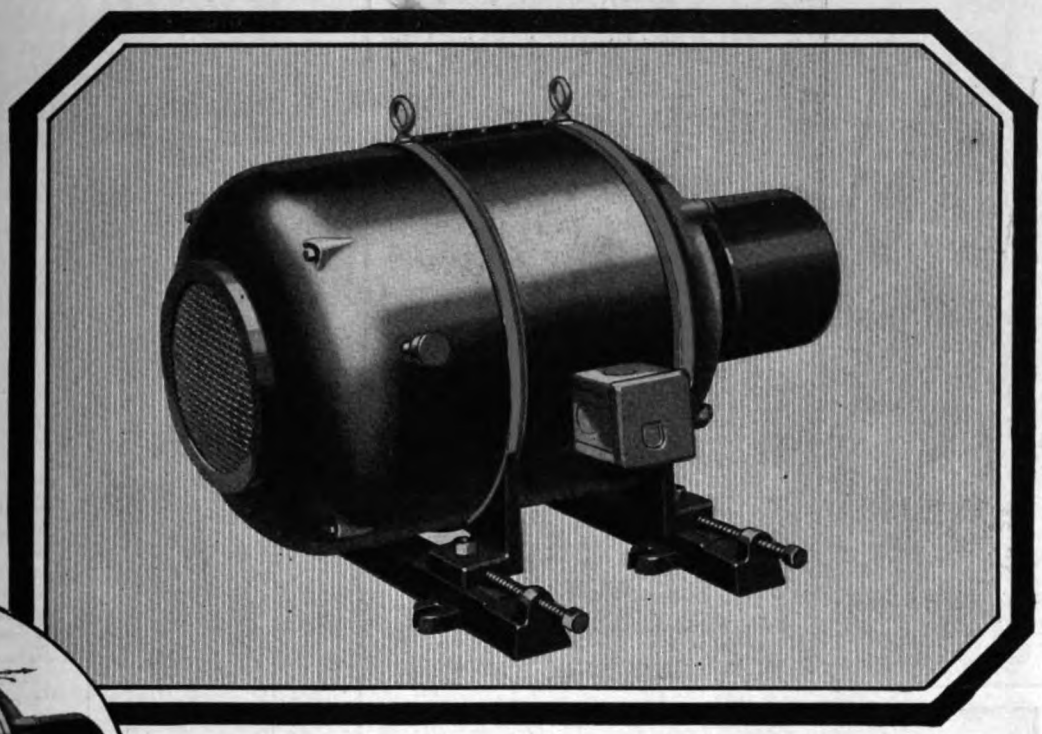
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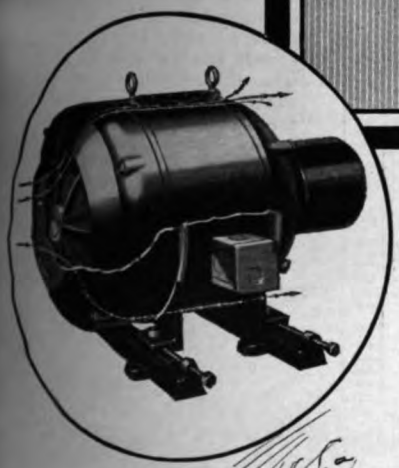
Company

City

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

a New HOWELL MOTOR





Totally enclosed - self-ventilating

The Howell organization announces a new motor

Totally enclosed, self-ventilating—fireproof, oilproof, dustproof, waterproof, fume and acid proof

And like all other Howell Red Band Motors—foolproof

With Timken Tapered Roller Bearings—sealed against entrance of foreign material—guaranteed to last the life of the motor

With double cotton-covered enameled wire—moisture and oilproof

With the patented Howell automatic bearing adjuster—that keeps bearings snug at all times and under all conditions

With the Howell guarantee and reputation of always making good on the hard jobs

And at a much lower cost than the ordinary totally enclosed motor.

(88)

Descriptive literature and prices upon application
—Branches in all principal cities

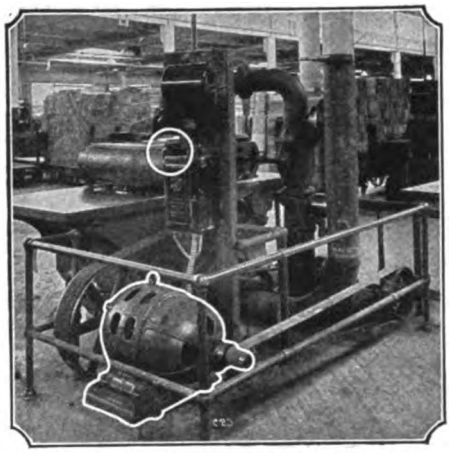
Howell RED BAND ELECTRIC Motors

Make Good On the Hard Jobs

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

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"... push-button control" without extra cost!







Here's the simplest, cheapest, and most efficient push-button control there is. No compensator, simple wiring. Motor size makes no difference. TR Self-Start operating characteristics make it possible. The installation is in the Globe-Wernicke plant at Norwood, O.

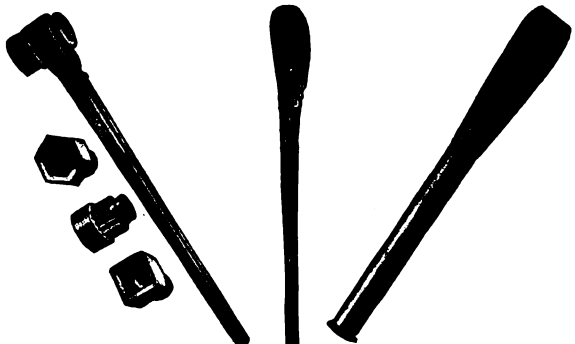
Send the coupon for more information and quotation on sizes needed.

THE TRIUMPH ELECTRIC CORP.
157 E. 70th St., Cincinnati, Ohio

The TR is an A.C. motor with improved operating characteristics—the modern super-motor. 250% starting pull instead of usual 80%. No compensator in any size. Cuts first cost and current costs. Junk old motor ideas and improve plant efficiency with the TR motor! Send coupon.

The Triumph Electric Corp.,
157 E. 70th S., Cincinnati, O. I.I.
Send TR motor bulletin and price list.
We need motors for these machines,
.....
(with) (without) push button control.
Name .....
Firm Name .....
Address .....
City ..... *State* .....

LOWELL
REVERSIBLE RATCHET
WRENCHES



ACCESSIBILITY SPEED CONVENIENCE
These three features are yours
when using a Ratchet Wrench
Add to these
REVERSIBILITY AND STRENGTH
and you have the ideal tool
MADE BY THE
LOWELL
WRENCH COMPANY
Worcester, Mass.
Ask your hardware dealer for them

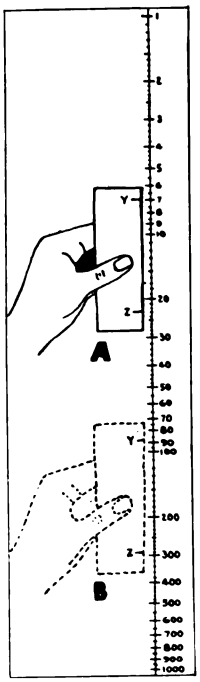
A Quick Pulley Chart

By W. F. Schaphorst

HERE is a simple little chart that does away with formulas for pulley computations. It will be found to be an exceedingly quick and satisfactory method for determining the sizes of two pulleys to be used in a drive, since, in solving the problem it is only necessary to slide the paper from position "B" to position "A" or vice versa. Any slip of paper will do.

For example, if you want one shaft of a given drive to run at 88 r.p.m., and the other shaft to run at 290 r.p.m., make marks Y and Z on the slip of paper in position "B" opposite the 88 and 290,—a very easy thing to do.

Now you can move the slip upward and get any combination of diameters you want. The ratio will always be 88 to 290.



A simple method for figuring pulley speeds and diameters. When both pulley speeds are known their relative diameters can be determined and if their diameters are known their speeds can be figured. Likewise if one pulley speed or diameter is known either the speed or diameter of the other can be learned by sliding the small slip of paper along the graduated scale as shown.

Thus if you happen to have a 7 in. pulley, which you think would be suitable for the 290 r.p.m. shaft, bring the Y-mark opposite the 7 as in position "A". The Z-mark then says that the other pulley must be 23 inches in diameter.

Of course, if these diameters are considered too small just move the slip a little lower until more suitable diameters are obtained. No matter where the slip is placed the ratio is always correct—no figuring is necessary.

The chart also lends itself readily to the solution o such a problem as, knowing the pulley diameters an knowing the speed of one of the pulleys, what is th speed of the other pulley? Try it. It is so easy that i needn't be explained in print. You can "guess it" in minute.

Also, you can add ciphers to the figures on the scal where necessary. Just add them mentally as you go along Thus if in the above example the speeds were 880 an 2,900 r.p.m., position "B" applies in exactly the same wa and you would get 7 in. and 23 in. respectively in pos tion "A." Very simple, but remember this: when yo add a cipher to one you must also add it to the other.

For ... not advertised in this issue write Industry Illustrated

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Send for this New Catalog

A GUIDE for selecting the most efficient Conveyor for the Particular Requirement. Seven standard Types—More than Fifty standard Sizes—Numerous Permanent and Semi-permanent installations.

HUNDREDS of illustrations tell thousand word stories at a glance. Handling everything from Coal to Bananas. Several pages illustrate standard Conveyors with various additions which have successfully solved many problems.

YOU will find things of great interest and profit to you in this New Catalog—Cheerfully sent on request.

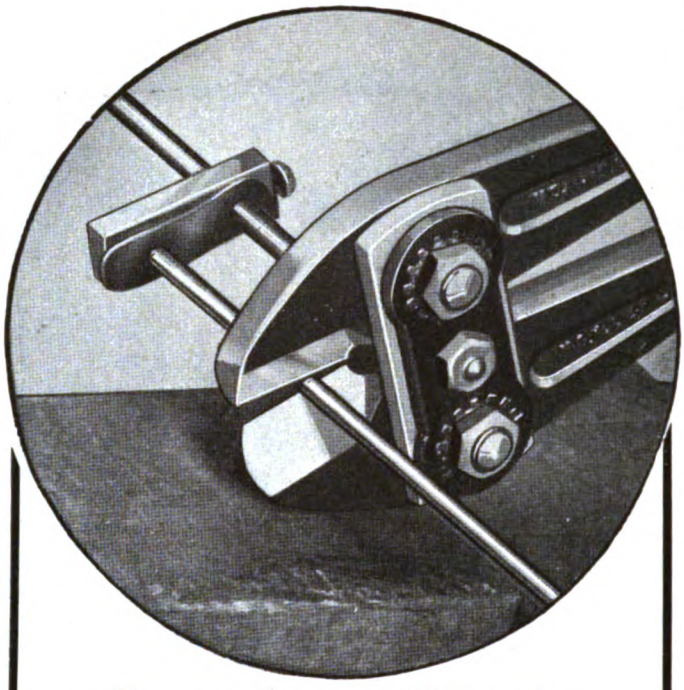
Ask for Catalog 327

Portable Machinery Company

Lakeview Ave., Clifton, N.J.

PORTABLE CONVEYOR SPECIALISTS

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Cutting Rods

TO AN EVEN LENGTH

The illustration shows a standard Porter Bolt Clipper fitted with a simple gauge used in wire work plants and elsewhere. The gauge is a convenience and not a regular or essential bolt clipper fitting.

Porter Bolt Clippers are made in a number of capacities to cut rods up to 5-8!! diameter or bolts in the thread up to 3-4"



Time Savers

PORTER'S BOLT CLIPPERS

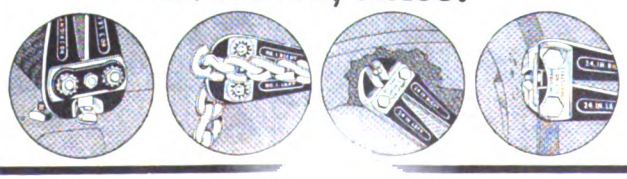
are cutting tools developing great power through leverage and a form of toggle joint. They multiply man-power about 70 times. Made in a number of styles for cutting bolts and rods, splitting nuts, cutting chains, etc. Moderate in cost and essential tool equipment for bench, shop, or kit.

Sold by Jobbers and Supply houses everywhere

Ask your dealer or write to us for booklet

H. K. PORTER, INC.

EVERETT, MASS.



Large Precipitator for Trenton Channel

ONE of the first large installations of equipment for the electric precipitation of ash in a powdered fuel boiler plant is being installed at the Trenton Channel power plant of the Detroit Edison Company. The installation, having what will probably be the highest power rating of any single electric precipitation of plant ever built, is being made under the supervision of the Research Corporation of New York City, and involves the use of the Cottrell process.

The smoke given off from the Trenton Channel powdered fuel boiler plant carries with it a large amount of fine ash which, if it were not removed in some way, would result in the distribution from the stacks of many tons of ash over the surrounding countryside. By means of the new precipitator this will be practically eliminated.

Nine precipitator units will comprise the final installation, each being served by two 25 kv-a. electrical sets. Two precipitator units are already in use and the remainder will be installed early this year.

The high voltage power will be supplied from eighteen specially designed, 25-kv-a. transformers, of which fourteen units are now under construction at the Pittsfield plant of the General Electric Company. These units will step up the 220-volt, single-phase, 60-cycle power supply to 75,000 volts. The high voltage will then be passed through mechanical rectifiers built by the Research Corporation and each driven by a single-horsepower, ball-bearing, synchronous motor of special design and furnished by the General Electric Company. The high voltage direct current from the rectifier will be applied directly to the treaters.

The precipitators are of the graded resistance type consisting of parallel grounded concrete plates between which will be suspended anodes connected to the negative side of the direct-current circuit. The positive side of the direct-current circuit will be connected to the concrete plates and a corona discharge will flow from the suspended anodes to the concrete cathodes.

The smoke exhausted from the boiler plant will pass between the concrete plates and the suspended ash will be ionized by the corona discharge and deposited on the concrete plates whence it will be removed periodically by mechanical means, dropping into hoppers below. Periodic removal from the hoppers will complete the process.

By means of a number of taps in the low-voltage winding of each transformer, it will be possible to select the best operating voltage at which the precipitators will operate. These taps will provide, besides the 75,000 volts, voltages of 70,000, 65,000 and 55,000.



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"We are using Arguto Bearings in countershaft hangers and they are entirely satisfactory"

"We have had Arguto Bearings fourteen or fifteen years. They're Worth their weight in gold."

"We have been using Arguto Bearings for 20 years or more in much of our machinery"

LET ARGUTO USERS TELL YOU

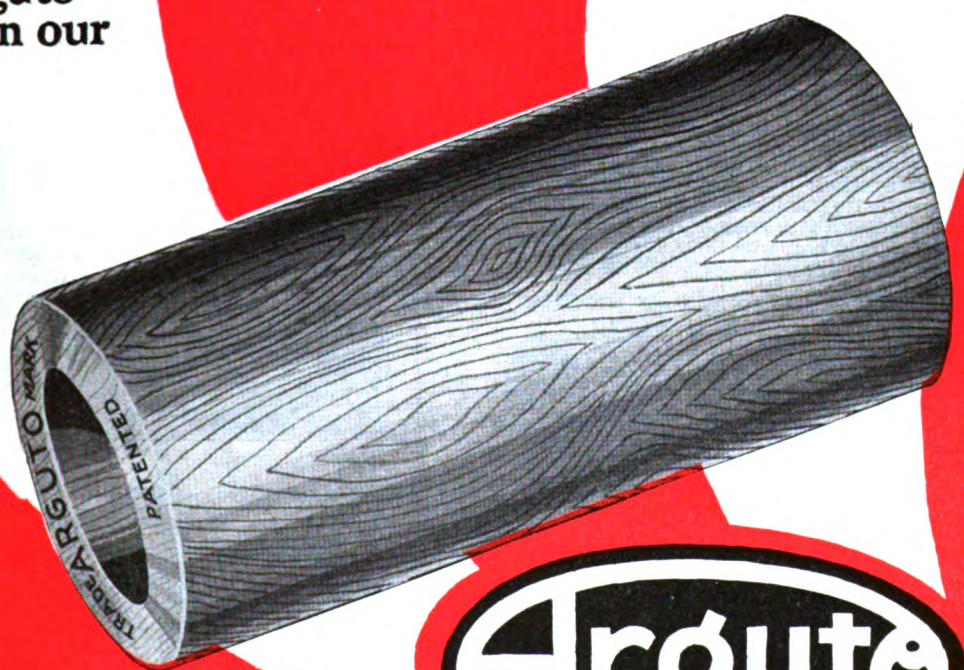
—and then prove in your own plant the truth of every statement they make.

Arguto's initial cost is one tenth that of Bronze. Argutos give service for twenty years or more. Argutos need no oil—and no attention.

Write today for information. Learn how Arguto Oilless Bearings keep up protection and *keep down* production costs.

ARGUTO OILLESS BEARING CO.
Wayne Junction
Philadephia, Pa.

"We are receiving splendid service from every Arguto Bearing in our plant."

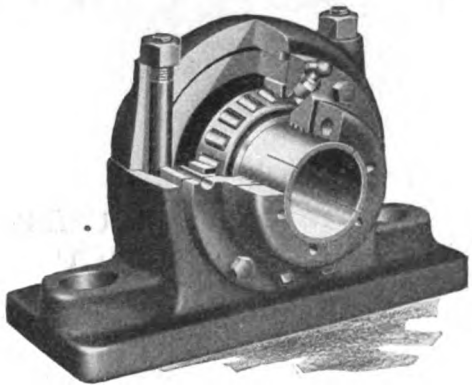


Arguto

OILLESS BEARINGS

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Ready Now~ MEDART TIMKEN EQUIPPED LINE of Industrial Applications

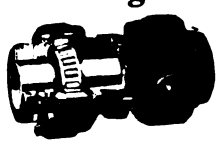


1 Spherical Ball & Socket Pillow Block

—when adapted to line shafting and other kindred uses, saves power, lubricant, preserves alignment and practically eliminates wear. Provides desirable economies, particularly in duplicate machinery. Can be modified to suit any engineering or structural requirements.

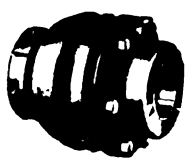
2 Ball & Socket Hanger Bearings

—when applied in either Medart post or drop hanger frames for support of line shafting, takes out the heavy drag and saves lubricant, wear, fuel and power.



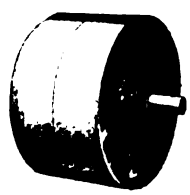
3 The Unit Mounting

—meets the needs of various machine designs and heightens the value of duplicate machinery. Mountings furnished with a number of different type housings to suit various designs of machines or special equipment.



4 The Loose Pulley

—when Timken equipped and adapted to line shafting and countershaft usage, materially reduces friction and assists in cutting down power bills. A trial installation convinces.



This added Line makes Medart a more complete source for mechanical power transmitting machinery and allied products than at any time in its nearly 50 years of serving Industry. Ask for Bulletin on Timken-Equipped Line and for Catalog No. 43 on all other Medart Transmitting Equipment.

THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U.S.A.
Office and Warehouse in Cincinnati — Offices in Chicago, Philadelphia, New York, Pittsburg and Seattle.

MANUFACTURERS OF POWER TRANSMITTING AND KINDRED MACHINERY

MEDART
Everything in Line Shafting Equipment

Safety Platform Protects Window Washers

By George F. Paul

AT some factory buildings where special provision has not been made for a window washer's equipment, his work often constitutes a distinct hazard. At the plant of the Canonsburg Can Co., Canonsburg, Pa., a special safety platform has been devised which has



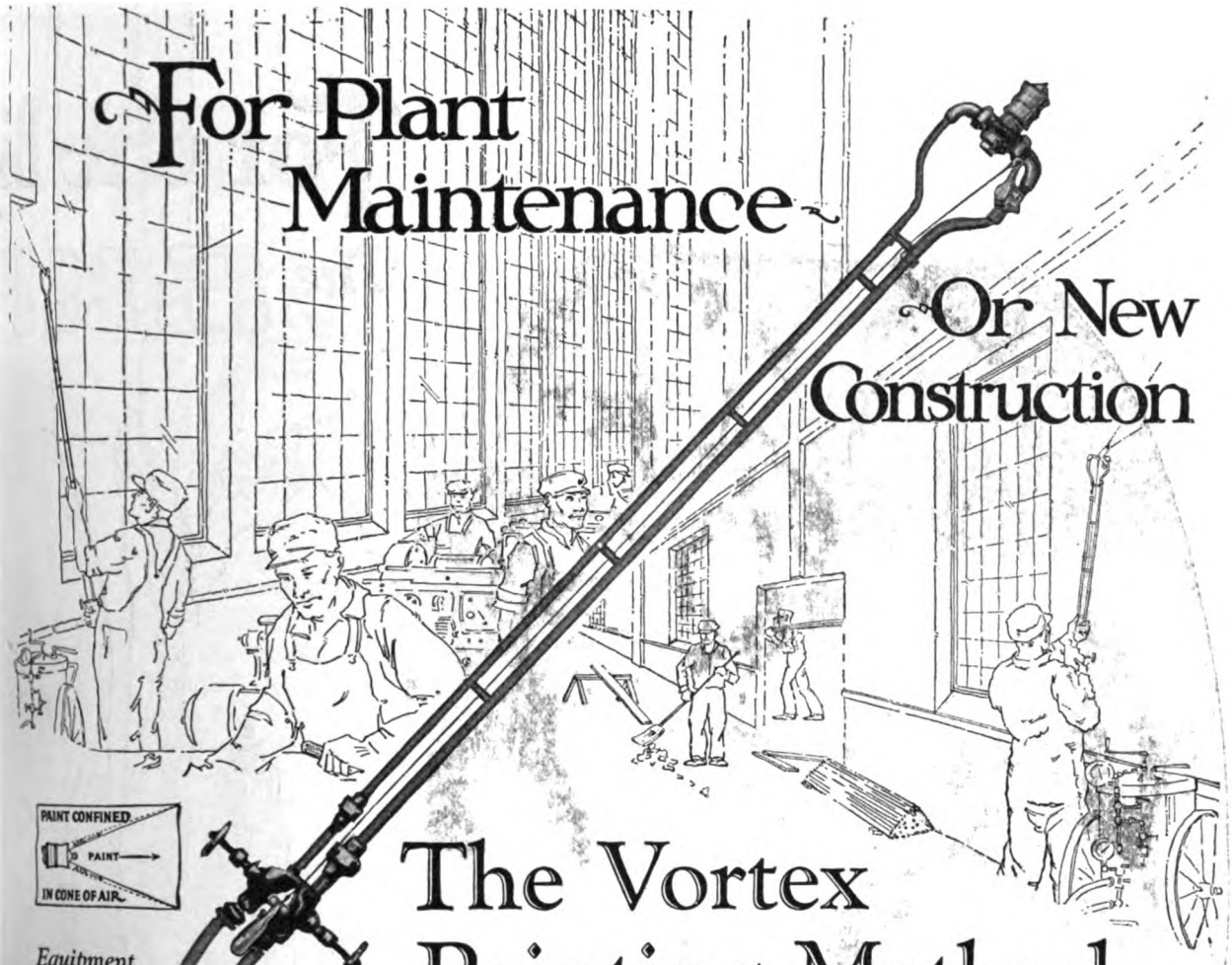
several features to recommend it. The framework i of steel. The whole is light enough to be movable, an yet strong enough to be substantial and highly practical.



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For Plant Maintenance—Or New Construction



Equipment Furnished Without Cost

The Vortex Painting Method

for years past has been solving the maintenance painting problem for the biggest industrial concerns—cutting costs in two, with better results.

Now the same organizations are turning to Vortex Painting for their new plants and their plant additions—a good idea for owners of new industrial buildings everywhere.

Nothing else can rush a big painting job to such rapid completion—or save so much money—or do a better job. Let the coupon put you in touch with Vortex Paints and the Vortex Method.

THE VORTEX MANUFACTURING CO.
1977 West 77th Street Cleveland, Ohio



THE VORTEX MANUFACTURING CO., Cleveland, O.
Without obligation, please furnish me data as to painting costs on the following·

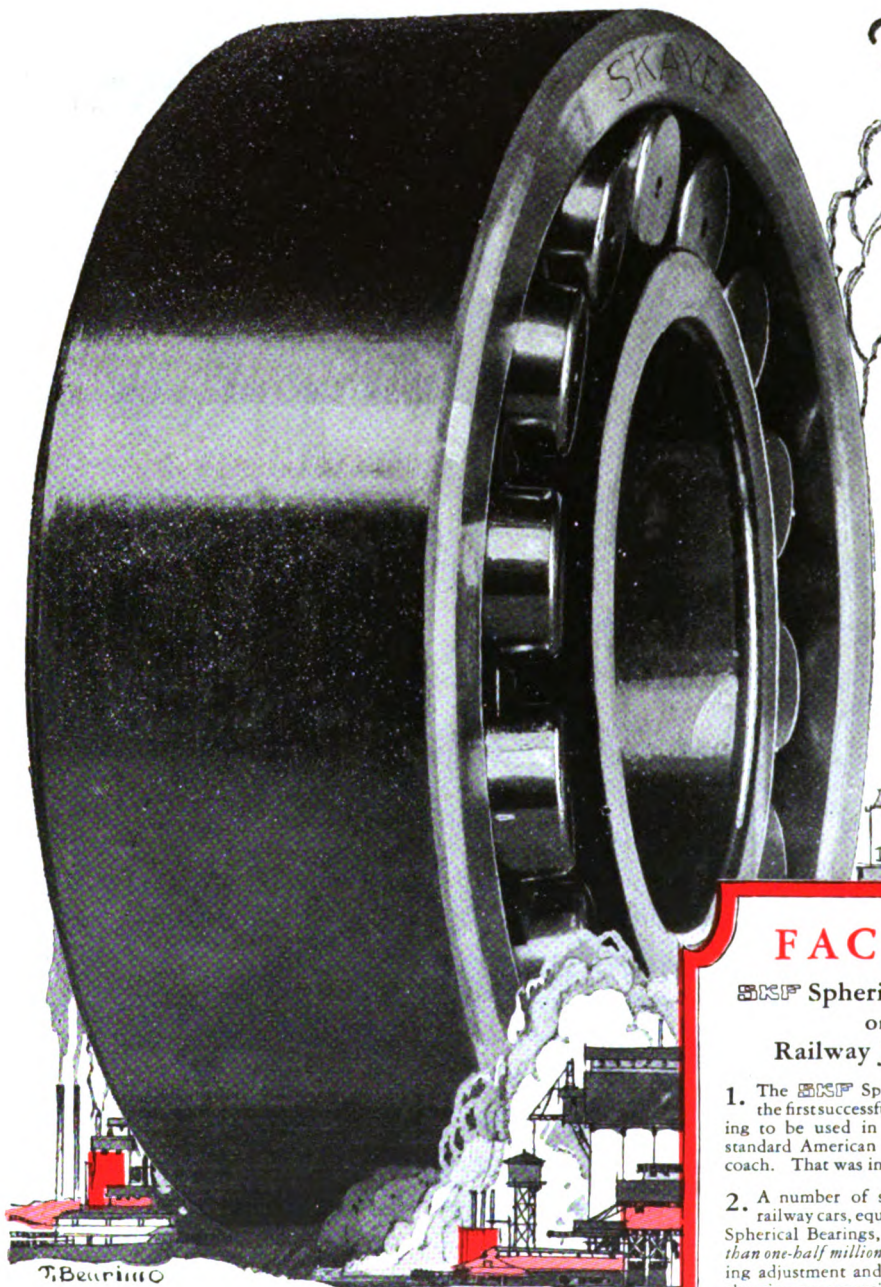
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For the Big

The SKF





FACTS!

SKF Spherical Bearing on Railway Journals

1. The SKF Spherical Bearing was the first successful anti-friction bearing to be used in the journals of a standard American railroad passenger coach. That was in 1921.

2. A number of standard American railway cars, equipped with SKF Spherical Bearings, have covered *more than one-half million miles* without bearing adjustment and with the bearings showing no appreciable signs of wear.

3. SKF Spherical Bearings are in use today on more than seven thousand standard railway passenger cars, cafe cars, diners and auxiliary railway equipment throughout the world.

* * *

The performance of this bearing in heavy railway work over a long period of years is the thing which is responsible for the present interest in anti-friction bearings on railway journals.

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ANTI-FRICTION BEARINGS

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BRUTE Jobs of Industry
SPHERICAL BEARING



HERE is an anti-friction bearing that was MADE to do the big jobs of industry —the heavy jobs—the brute jobs.

On the great bulking monsters that grind the pulpwood that gives us our daily newspapers.

On the giant crushing rollers in flour mills. On rock crushers, coal crushers—on ALL Jobs that demand rugged, unfailing performance under the severest service conditions that a bearing can be called upon to meet—

These are the jobs on which this SKF Spherical Bearing has been functioning for years—the jobs on which its stamina, its ability to take punishment have been proved!

The SKF Spherical Bearing is not a new bearing. SKF would not endorse it if it was. It is time-tested. It has been used for years in the journals of standard American railway passenger coaches. The railway journal application of anti-friction bearings considered, at one time, the supreme test of bearing stamina is far from representing the maximum of punishment that this bearing will take.

But, lately, industry has discovered in this bearing qualities that no other anti-friction bearing possesses.

It is the only heavy-duty roller bearing that approaches the anti-friction qualities of the ball bearing.

It is practically the only roller bearing ever produced for combined radial and thrust load that is made as well as a ball bearing is made, from the standpoint of materials, workmanship and finish.

And, so, SKF offers this bearing to industry for any job that is worthy of its steel—for the big job—the brute job. For, this bearing, alone, has proved that it could *stand up* not in the laboratory, not on paper, but through years of actual gruelling service under conditions that caused all other bearings to fall down.

Your bearing problem may require the SKF Spherical Bearing–or it may demand a bearing of an entirely different type. Whatever your problem is, put it up to SKF with the assurance that you will receive unbiased bearing counsel. For SKF makes an anti-friction bearing for every need known to industry.

SKF

More than 100 factory offices throughout the world

SKF
Puts the Right Bearing in the Right Place

SKF INDUSTRIES, INC. ~ NEW YORK CITY

1781

FOR EVERY PURPOSE

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You can brighten up your office and factory walls, both inside and out, at a cost that is surprisingly low. Your handy man can get results that are almost unbelievable. Paint by machine, and you will refinish buildings for which you could never have authorized the cost of hand brush painting.

With the Binks Portable Spray Painting Outfit you secure all of the advantages of the famous Binks Spray Gun. This gun is used as standard equipment by leading manufacturers for finishing their finest products. The list of companies using the Binks Spray Gun for portable painting reads like the blue book of Industrial America.

The BINKS Spray Gun

enables you to spray any surface no matter how rough, dirty or weather-worn; it enables you to spray successfully any paint, varnish, lacquer, enamels, graphite or aluminum paints. By the use of this gun, the operator can avoid any excessive spray mist. This without interference of production. Our simple directions tell you how.

A One-time Investment Pays for Itself!

A Binks Portable Spray Painting Outfit is a one-time investment that quickly pays for itself,—an investment that will save you maintenance costs for years to come. Further interesting details will be mailed upon request. Write today.

BINKS SPRAY EQUIPMENT COMPANY

Dept. C, 3133 Carroll Ave., Chicago, Ill.

Offices in Principal Cities

ESTABLISHED 1898

Large Steel Mill Operating With New Electric Drive

ONE of the largest steel plants in the West, that of the Colorado Fuel & Iron Company at Pueblo, Colorado, has now started operation with its new electrical equipment. This company recently made a complete (with the exception of its blooming mills) change-over from steam to electric drive, using electricity generated on the premises in the largest industrial power plant in the Rocky Mountain region.

The company was incorporated in 1892 and, until a few years ago, all power used in the plant was derived from steam engines. Electrification was first considered during the period following the war, and the initial program included a power plant, the electrification of the rod and 10-inch mill, the 14-inch mill and the rail mill.

All the main electrical equipment, including the turbine generators in the power house, was furnished by the General Electric Company. Among the items are three 10,000-kilowatt turbine generators to furnish power for the various mills, and two 1,000-kilowatt motor generators to furnish direct current to the power house and the adjacent mills.

An outstanding feature of the fuel supply is blast furnace gas cleaned by electric precipitators. Powdered coal is used as a standby fuel. The reduced steam requirements resulting from electrification, together with the more efficient use of blast furnace gas, has resulted in shutting down approximately 85 per cent. of a boiler plant containing thirty 500-horsepower, hand-fired boilers.

The switch house contains three buses, one main 6,600-volt bus for supplying large blocks of power to the various mills, an auxiliary 6,600-volt bus for supplying smaller blocks of power to various outlying operations, and a 2,300-volt auxiliary bus for the power house auxiliaries. All power leaves the power house at 6,600 volts, as generated and as used by all the large alternating current motors.

The rod and 10-inch mills, the first in operation, are located in the same building and use the same billet heating furnaces and continuous mill. This mill was originally driven by four reciprocating engines, now replaced by two 3,000-horsepower, slip-ring, induction motors, two 1,000-horsepower motors of the same type; two 1,500-horsepower, direct current, adjustable speed motors, and a 300-horsepower motor of the same type. One of the 1,500-horsepower motors, located in a separate motor room, is supplied by a 1,600-kilowatt synchronous converter also located in the same room. The other 1,500-horsepower and the 300-horsepower motor, located in the main engine room, are supplied by another synchronous converter of 1,600 kilowatts capacity. All the alternating current motors drive the stands through reduction gear, whereas the direct current motors are direct connected.

The 14-inch merchant mill was originally driven by a single engine connected to the continuous stands with rope drives connecting the intermediate and finishing stands. This was replaced by a 1,500-horsepower, direct current, adjustable speed motor connected directly to the intermediate stands with a rope drive to the continuous stands, and a similar 750-horsepower motor directly connected to the finishing stands. A 1,600-kilowatt synchronous converter, a duplicate of the two in the rod and 10-inch mills, supplies power to these two motors.

The rail mill was formerly driven by an engine

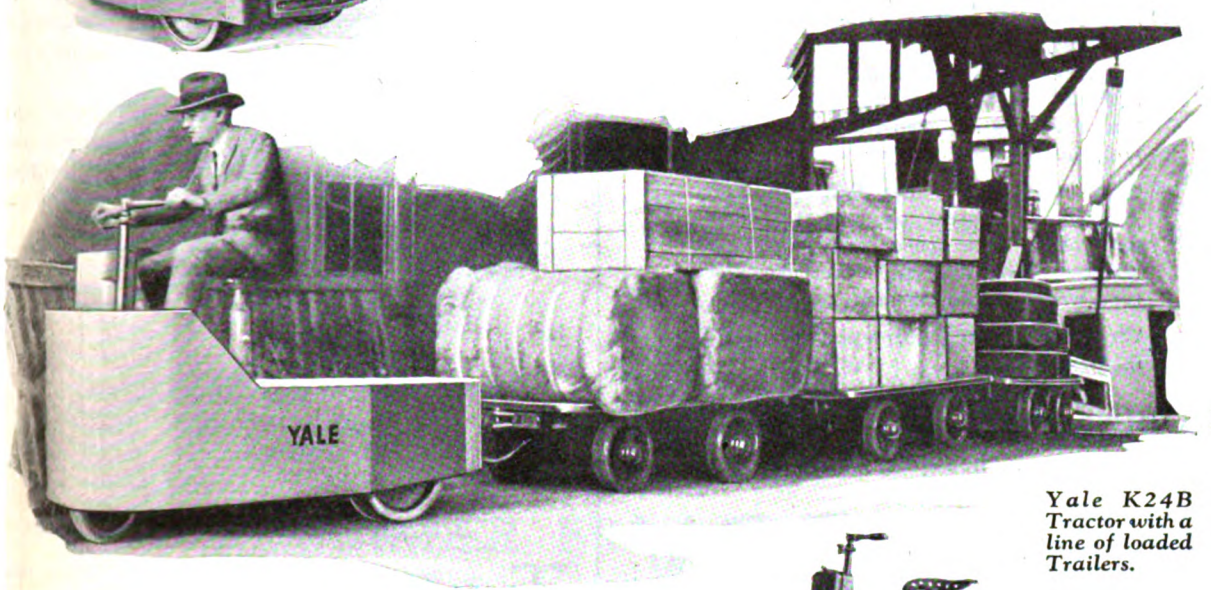
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TRADE **YALE** MARK

YALE—the Key to lower handling costs. Chapter 40 on *Storage Battery Trucking*.



Yale K24B



Yale K24B Tractor with a line of loaded Trailers.

Yale Tractors for a Big Saving



Yale K24A

Yale tractors are operated on a considerably smaller battery than other types of tractors for a given amount of work. This means a more highly efficient unit, less current requirement and big savings in maintenance cost.

Its efficient spur-gear drive is characteristic of the entire line of Yale K Series Electric Industrial Trucks and Tractors.

The Yale Model K24A tractor is small in size, will operate in narrow aisles and congested places and has the smallest possible turning radius as operating efficiency will permit. Note the design of the tractor with its one piece welded heavy steel armor of protection which entirely encircles it. This construction prevents damage to any of the operating parts of the equipment even though subjected to the most severe shocks in collisions. The position of its battery and drive unit, both of which are underslung below deck, prevents the possibility of tipping over while in service.

These features are exclusively Yale.

The Yale K24B tractor contains all of the features of the K24A model except that it is equipped with a larger Battery Compartment. This larger Battery Compartment is primarily for the purpose of making possible the interchangeability of Batteries on installations where larger Batteries are already in service. Due to the fact that the Drive Unit is identical in the K24A and K24B, this larger Battery will permit many more hours of operating service.

Send for Yale Bulletin on K24A and K24B Tractors.



The Yale & Towne Mfg. Co.

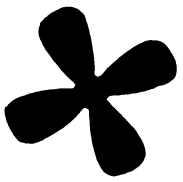
Stamford, Conn., U. S. A.

YALE MARKED IS YALE MADE

Hoisting and Conveying Systems

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More Air — Less Power



With

Robinson Man Cooling Fans

Robinson Man Cooling Fans are equipped with cast aluminum wheels. These wheels are also furnished separately for replacements parts.

Tests have shown that Robinson Cast Aluminum Wheels produce 15%-20% more air at same speeds with considerable less power than any other propeller type wheel on the market.

Write for further information and testimonials.

ROBINSON VENTILATING CO.
Zelienople, Pa.

ROBINSON
TURBINE & CONIFLO FANS

The Finest Wrenches Made!

Armstrong Vanadium
Super-Quality
Wrenches



Extra Thin
Extra Long
Extra Light
Extra Strong

Drop-forged from chrome-vanadium steel, specially heat-treated and finished in nickel over copper, with heads buffed bright. Warranted not to break nor spread.

Here's a wrench that every mechanic will want on sight. The thin, narrow, powerful jaws make it easy to pull up nuts in unhandy places. Gives longest possible service under the toughest wear. Write for descriptive folder showing sizes and prices.

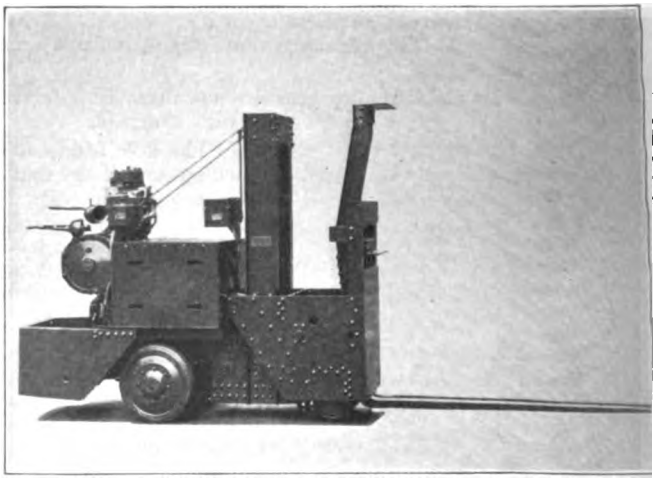
ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
318 N. Francisco Avenue
CHICAGO U. S. A.

the roughing stand and a second engine on the intermediate and finishing stands. These two engines were replaced by a 2,000-horsepower, alternating current, slip-ring, induction motor on the roughing stand and a similar 3,000-horsepower motor on the intermediate stands. The finishing stand was separated from the intermediate, and a 1,200-horsepower, alternating current, slip-ring motor now drives this stand. All these motors drive the mills through reduction gears, and in the case of the roughing and intermediate stands, the original engine fly wheels were mounted on new bearings and connected to the mill side of the reduction gears. Permanent resistance is inserted in the secondary of these motors to take advantage of the flywheel effect.

It is said that large economies are expected in power, labor and maintenance by the electrification. The old engines which exhausted to atmosphere, it is reported, were uneconomical and their operation required a larger number of men than is required for the motors.

Truck Carries Large Crates

THE Baker-Raulang Co., of Cleveland, have recently adapted the Baker Hy-Lift truck for carrying large crates or similar packages. As the accompanying illustration shows, the carriage is fitted with two forks in place of the usual platform and clamps are provided for securely holding either one or two packages. This machine was developed for a large manufacturer of electric ice cream cabinets for soda fountain use. These



cabinets are packed in crates of uniform size and 3-in. 3-in. cleats are nailed to the bottom, thus raising t crate off the floor so that it may be picked up with t forks.

The clamping action is entirely automatic and tal effect as soon as the truck commences to lift. One cr may be picked up and placed on top of another and th both of them carried on one load. In this case the lov clamp drops back out of the way and the upper cla comes into operation.

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"TENTACULAR" Transmission Belt

Patented August 7th, 1923



GAS EXTRACTOR
Motor 9 H.P. Pulley 6″ diameter.
Driven Pulley 42″, Centers 30″.
Arc of contact 112°.

The unique construction of Tentacular combines in one belt a variety of features which cannot be found in any other type of power transmission device, viz.: extremely high adhesion, high tensile strength, very little stretch, elasticity, quietness.

Tentacular operates equally well at very high or very low speeds. It will transmit much more horsepower than ordinary belting.

Tentacular is unrivalled for drives with short centers and high pulley ratio.

No special pulleys required. Idlers eliminated.

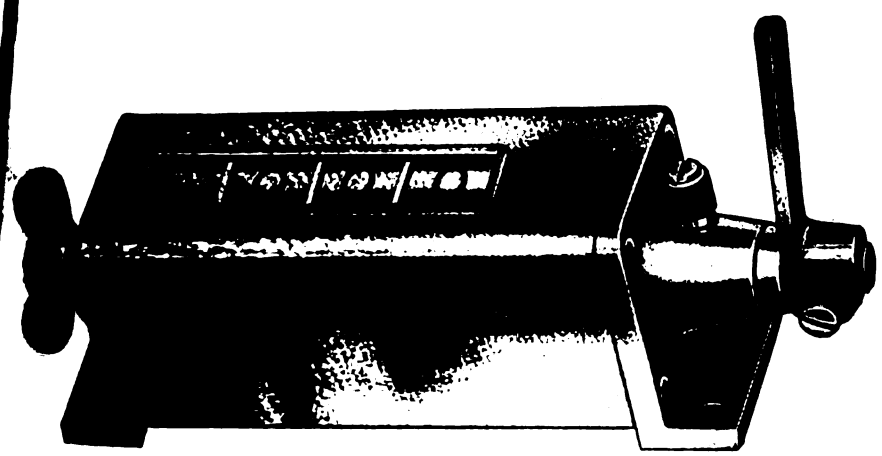
Tentacular means Simplicity—Economy—Efficiency. The latest and most decided improvement in power transmission.

It will pay you to get acquainted with Tentacular. Write for booklet.

ALEXANDER BROTHERS, INC.

Manufacturers and Sole Licensees for the U. S. and Canada

16 South Street, Philadelphia, Penna.



Veeder

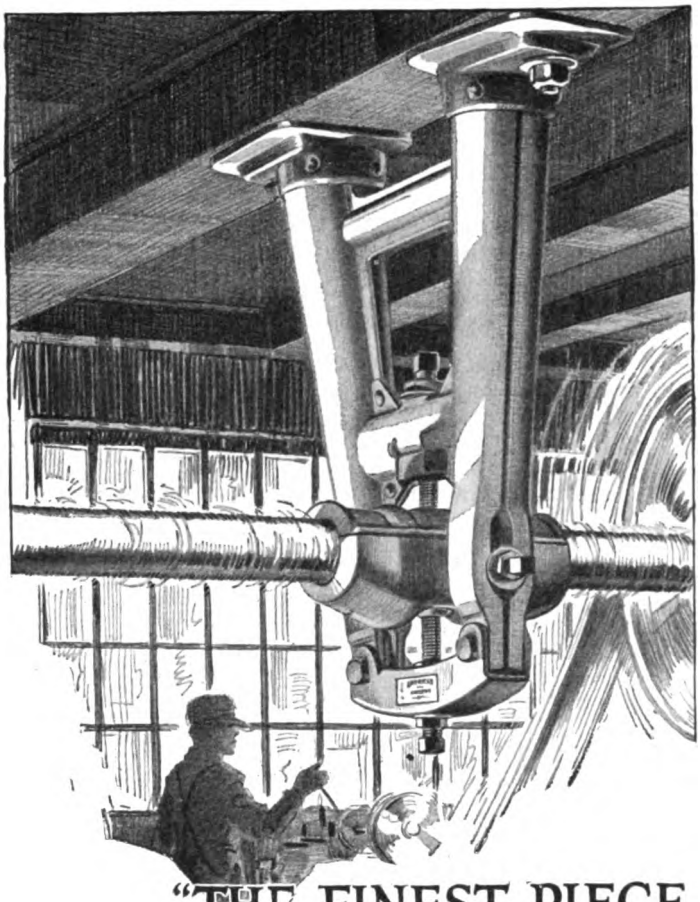
Set-Back Counter

Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

It's "blind work" at any machine where the record of output isn't *in sight*. The worker who cuts down production-cost must have his eyes open every minute! He'll be watching the every-minute count on the dial of a Veeder Counter. He'll be aware that a visible record is *seen* by his boss and his fellow workers. He'll be trying to make the kind of record that shows what he can *DO*. We'd like to send you booklet showing the Counters.

THE VEEDER MFG. CO., 31 Sargeant Street HARTFORD, CONN.

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"THE FINEST PIECE OF METAL STAMPING I EVER SAW"

THIS was the initial remark of an industrial engineer after he had looked over his first American Pressed Steel Shaft Hanger.

Then, as he carefully examined in detail the construction of the hanger, he noted the design, the unusual strength and rigidity against vibration; the smooth, round surfaces, without dust pockets, that make for cleanliness; absence of projecting parts that assures safety; the provisions for quick and accurate adjustments and the graceful lines that contribute to the appearance of any shop which is equipped with American Pressed Steel Hangers.

Not only is the American Pressed Steel Shaft Hanger an example of fine, accurate metal stamping, but it embodies all the engineering principles that assure satisfactory performance.



THE American Steel Split Pulley is used in every country where manufacture is an important industry.

An interestingly illustrated folder fully describes this hanger. Send for your copy.

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks, and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia

For the nearest "American" dealer see MacRae's Blue Book

AMERICAN PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS

PATENTED

Methane Detector

A RECENTLY invented electrical detector of "fire damp" or methane, the combustible gas which is responsible for coal mine explosions, is expected by scientists to put an end to much of the loss of human life in coal mine disasters.

Methane, which exudes from some coal measures at unexpected times, is one of the most treacherous problems with which coal mine operators have had to contend. It cannot be smelled and gives no warning of its presence until an explosive mixture builds up. A spark struck from a coal cutter or the trolley of a mine's railroad may cause a serious explosion.

The solution of this problem means the annual saving throughout the world of literally hundreds of lives and the end of the untold suffering which accompanies such catastrophes.

The new detector, which will probably supplant some of the devices used in the past, was developed as a result of research work inaugurated by coal mine operators and state legislators of Utah, who are bending every effort to prevent a recurrence of coal mine explosions in that state.

Among the organizations which volunteered to work on this problem was the Union Carbide and Carbon Corporation. It offered the services of some of its chemists at its Long Island City Laboratories. Led by E. K. Judd, this research group assembled various facts which have been known for some number of years and developed an apparatus which detects methane instantaneously, accurately and with extreme simplicity.

A platinum coil is the basis for the detector. Heated to a constant temperature, such a coil becomes slightly hotter in the presence of methane; and the more methane, the hotter the platinum coil gets. This filament, one inch or so long and five thousandths of an inch in diameter, is secured at the end of a stick. It is connected with a portable storage battery which heats it to a constant temperature. The current from the battery is maintained constant by a simple automatic control, so any variation in the heat of the coil is caused by the combustion of methane at the surface of the wire.

The temperature of the coil is then shown on a dial indicator, which is so calibrated to register the amount of methane in the atmosphere around the coil. In order to prevent an explosion starting from the hot coil, it is protected from the surrounding atmosphere by gauze bonnets.

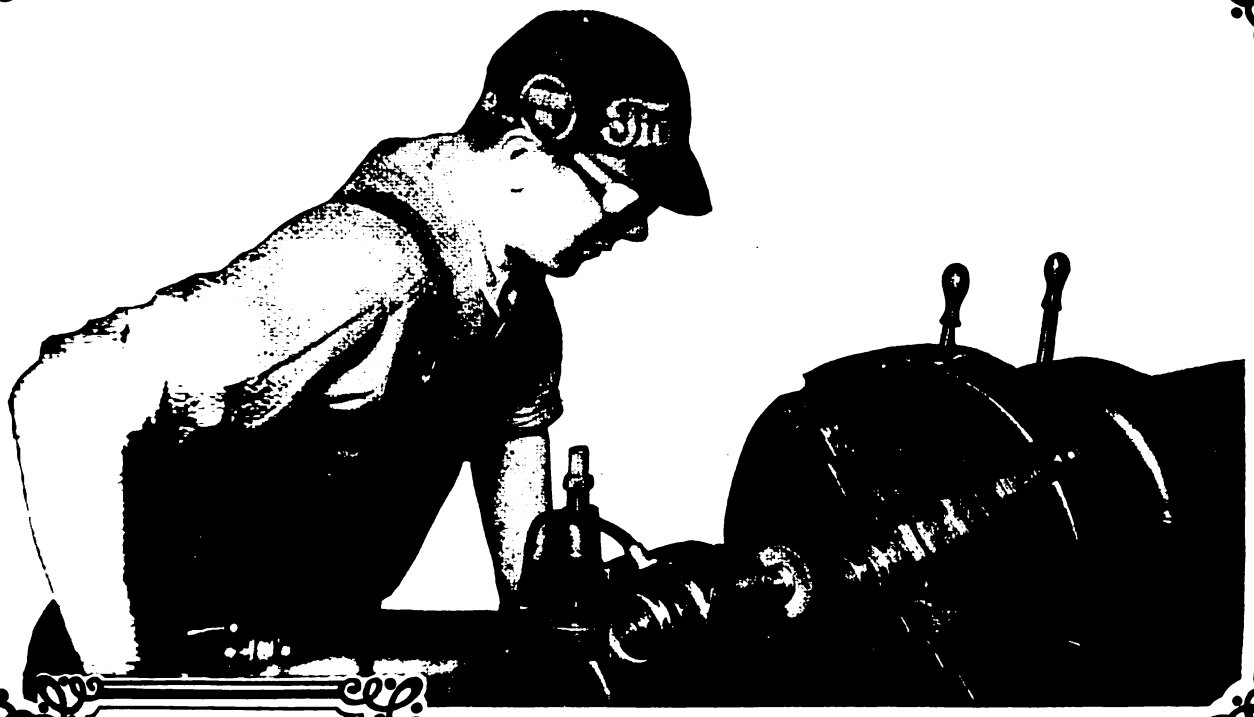
Since it can be attached to a telescopic stick of any length, this sensitive instrument can be poked into the highest crevices on a mine level. The wires connecting it to the battery and indicator, of course, can be of any desired length. The battery and indicator are carried on the guard's belt. It is of course possible to install permanent indicators at desired points, which would be wired to a recording device in the mine office.

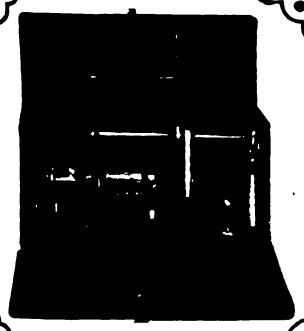
While the indicator registers immediately the presence of an increasing amount of methane in a steady rise of the needle, if there is five per cent. methane in the air (the danger point), the needle will swing back and forth rapidly.

The detector has met with considerable success in both laboratory and field tests. Mr. Judd lately spent some time in the anthracite coal regions of Pennsylvania, where he demonstrated the device to coal mine operators and

For p *sed in this issue write Industry Illustrated*

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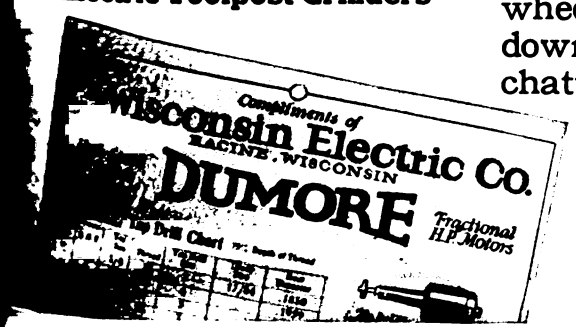




NEW CARRYING CASE

In the illustration above the Dumore No. 2 AG Grinder appears in the new steel carrying case. The case is designed to hold the grinder and all equipment. This feature makes it easier to carry the grinder from one job to another. Both No. 2 AG and No. 3 Grinders will now be shipped in these steel cases.

DUMORE
Electric Toolpost Grinders



FREE—Tap Drill Chart
Mail the Coupon

ACCURATE FINISHING

ACCURATE finishing is essential to modern toolroom and machine shop work. Dumore Grinders maintain the required accuracy on close limit external and internal precision grinding, on large and small work.

Every Dumore Grinder is dynamically balanced. Speed ranges are variable, 3,600 to 50,000 R.P.M. These features eliminate vibration and provide correct speed for all sizes of grinding wheels used. Correct speed and absence of vibration insure the grinding wheels cutting freely without breaking down—eliminating taper, bellmouth and chattermarks.

WISCONSIN ELECTRIC COMPANY,
70-16th Street, Racine, Wisconsin.

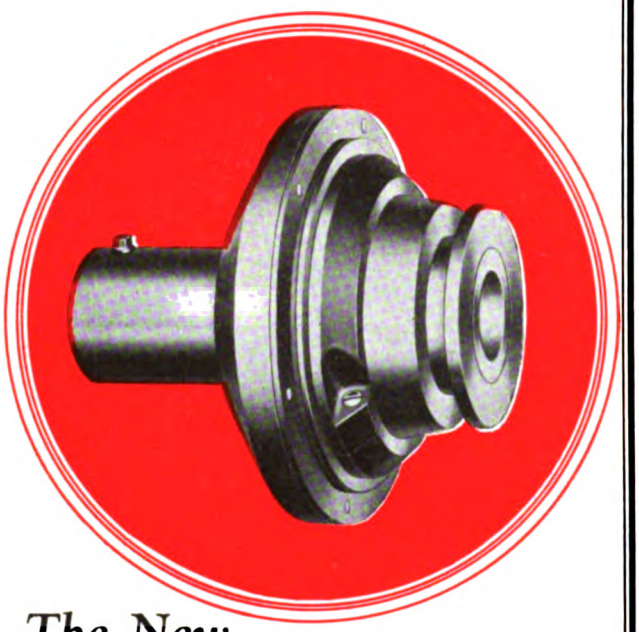
Please send me a FREE tap drill chart. Also explain your exchange plan on Dumore Grinders.

Name .....

Address .....

City ..... State .....

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The New

CONWAY
DISC CLUTCH

After many years of experimentation and tests, we have brought out the Conway Disc Clutch that has the following salient features:

1. The Clutch presents only a finished cylindrical contour.
2. There are no flying bolts, toggles, levers or pins.
3. The actuating parts are completely enclosed, yet the adjustment is handy and plentiful and clamps tight, being a simple split ring with a smooth finished surface.
4. The levers are alloy steel with a large factor of overstrength. Their under-slung position permits a large lever ratio which requires only slight pressure for engagement.
5. Centrifugal force would disengage the clutch when the cone is withdrawn, even if there were not springs forcing the plates apart. Vibration cannot cause the cone to withdraw, as this part is machined with a proper deflection angle.
6. A unique process of treating the key surfaces has practically eliminated wear in the splines.
7. The clutch is probably the quickest and easiest disassembled unit of its kind produced.
8. All discs are treated steel with woven asbestos lining, with ground faces as standard production.
9. The body of the clutch is counterbored to permit the pulley hub to extend under the point of frictional driving contact, which also saves considerable shaft space.
10. The clutch is inherently balanced.

We are ready to send descriptive matter and complete information.

THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio

others concerned with the problem. Further demonstrations were held in a Utah mine the first of February.

The actual work on the apparatus was commenced in 1924, following the disaster on March 8 at Castle Gate mine No. 2, in which 172 workmen lost their lives. At that time the governor of Utah appointed a committee to study all phases of the problem, and this committee, in turn, enlisted the aid of scientists all over the country in a cooperative research. The electrical detector is one of the first adequate developments of that research work.

New Wind Tunnel for New York University

NEW YORK UNIVERSITY is now arranging for the installation, in its new Daniel Guggenheim School of Aeronautics, of a wind tunnel which, when completed, will represent the most up-to-date equipment in existence in this country for testing airplane models. Air velocities in the tunnel will, it is estimated, exceed 100 miles an hour.

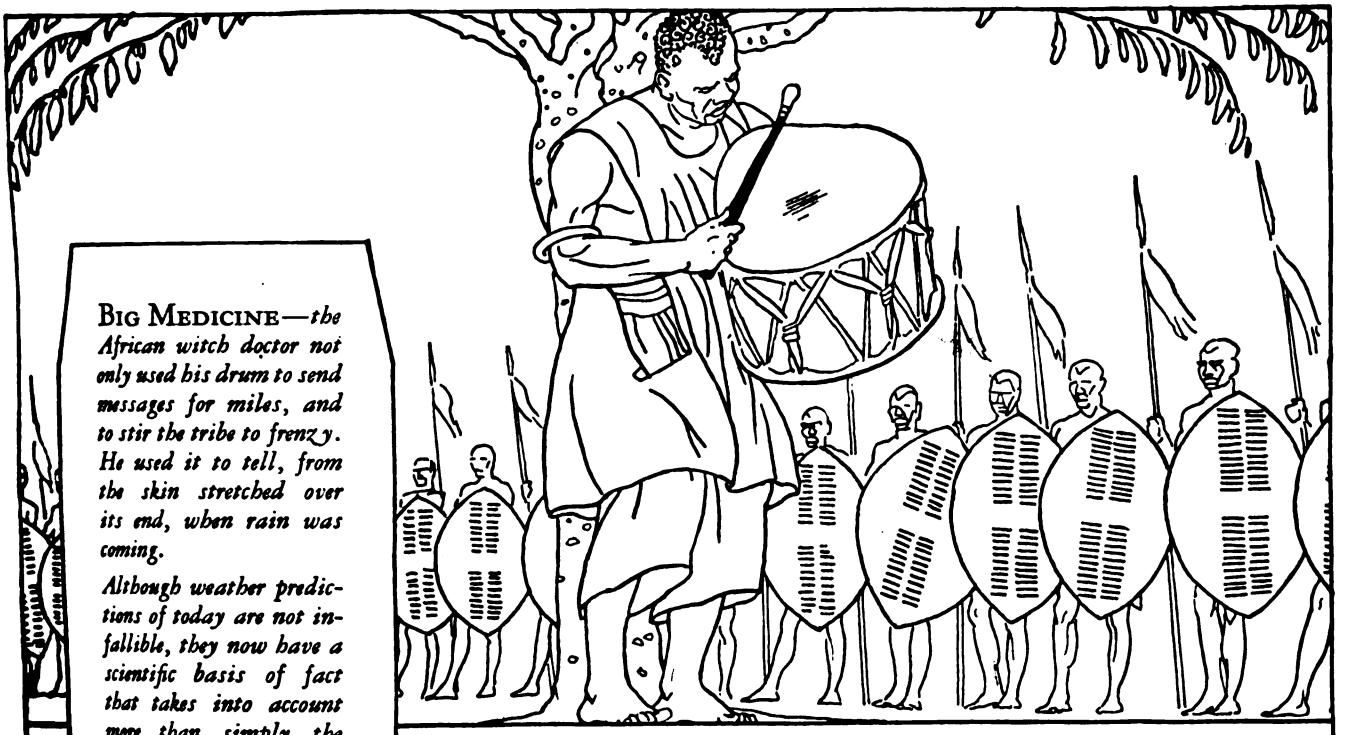
The college of engineering in that university already has available for aeronautical study a four-foot wind tunnel of the British National Physical Laboratory type in which experimentation is conducted up to air velocities of 60 miles an hour. Although primarily employed for purposes of instruction, the tunnel is available for tests and investigations in the study of airplanes and airships in such allied fields as ventilation, the study of fans and windmills and the measurement of wind pressure on structure.

The Daniel Guggenheim School of Aeronautics is housed in a new building erected on the campus of the University, and the new wind tunnel is housed in the building. This tunnel will be of the double-return type having a diameter of nine feet at the working section and an overall length of 110 feet. It will be employed for the testing of airplane and airship models, for the study of aerodynamics or the science of air flow and for problems in ventilating and heat transference.

The tunnel will be electrically operated, all the electrical equipment being supplied by the General Electric Company. The wind tunnel fan will be driven by a 2[illegible] horsepower direct-current motor direct connected to the fan shaft and will revolve at 600 r.p.m. Power for driving the motor will be furnished by a motor generator.

A very elaborate system of control will be used, allowing the fan motor to be started and stopped without the necessity of starting or stopping the motor generator. Fine adjustments of fan motor speeds and resulting wind velocities will be possible by the use of the variable voltage system of control. A small switchboard located in the scale room will allow the complete control of the wind tunnel motor by the person taking the readings in the scale room.

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BIG MEDICINE—*the African witch doctor not only used his drum to send messages for miles, and to stir the tribe to frenzy. He used it to tell, from the skin stretched over its end, when rain was coming.*

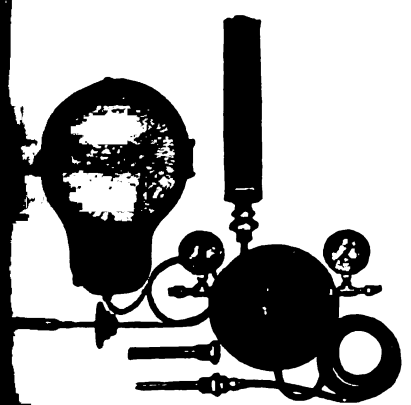
Although weather predictions of today are not infallible, they now have a scientific basis of fact that takes into account more than simply the moisture content of the air

A question isn't answered . . . unless it's answered RIGHT

Fairy tales, Easter bunnies and Santa Claus may be harmless food for children, but in the big matters of life only the truth satisfies. This is particularly so of those scientific instruments which indicate human or industrial health. For the difference of a degree may mean life or death, in the human body; and in industry, success or failure.

The men who first developed the thermometer were satisfied with nothing short of the truth. The men in the Taylor Instrument Companies who carry that first development farther, to the greater protection of human life and property, are just as insistent on accuracy.

Today there is scarcely an industry, scarcely a human activity, which *Tycos* instruments are not protecting. They answer the questions of temperature recording, measurement and control, of weather forecast—and answer them *right*.



Taylor Instrument Companies

ROCHESTER, N. Y., U. S. A.

CANADIAN PLANT
TYCOS BUILDING, TORONTO

MANUFACTURING DISTRIBUTORS IN GREAT BRITAIN, SHORT & MASON, LTD., LONDON

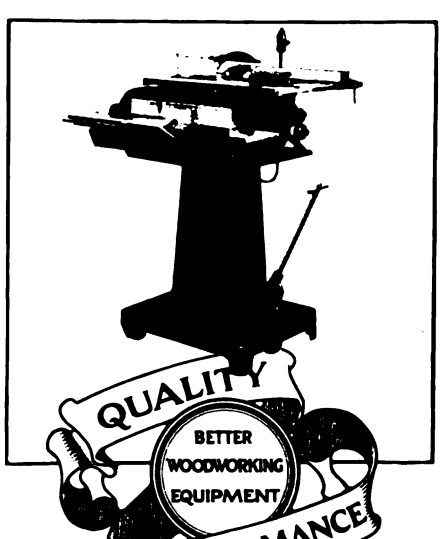
U.S. PAT. OFF. Tycos ROCHESTER, N.Y.

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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Two Machines in One

The Union Combination six inch jointer and Universal saw bench marks a great development in woodworking machinery. It has money saving features without parallel anywhere. You cross cut, rip, dado, groove, mitre, joint, rabbet, etc., all on one machine. Think of the saving this means to you—cuts labor costs in half—You have the upkeep of one machine instead of two—Initial investment is less and on top of all a machine unsurpassed in quality and performance.
All Union Machines are portable. Easily moved from one job to another.
For more efficient operation, lower costs and greater profits, Union Woodworking Machines are being used. Write today for detailed information.

Send for Catalog, it's Free

GALLMEYER & LIVINGSTON COMPANY
412 Straight Ave., Grand Rapids, Mich.

ESTABLISHED 1912

PLIMPTRUCK

B.E. SCRIVEN PATENTS

STABLE AS THE PYRAMIDS

The LIFT TRUCK with the Knuckled Steering Wheels



Here are four men—at least 680 pounds—all standing on the edge of a standard Plimpton truck,—still they can't tip it over.

These trucks are absolutely

Stable
Dependable
Durable

Let us tell you *why*.

Plimpton Lift Truck Corporation

National Distributor

C. A. GRAHAM,
170 Broadway,
New York City

Some good ter ries open

Branding English Walnuts

By D. Phillips

TO invent and perfect this beautiful piece of mechanism called into play some of the best mechanical minds from almost the whole civilized world. The Walnut Growers Association of California wanted a branding machine that would place the little diamond trademark of the association on the wrinkled cheek of an English walnut, and do it quickly and economically. It took seven years of work and experimenting on the part of inventors and mechanics to bring this about.

About seven years ago the association advertised in a well known household magazine that it would pay $10,000 to the man who would invent a practicable principle of a machine which would successfully and economically place its diamond brand on the uneven surfaces of walnut shells. In response to that advertisement it received 9,000 replies from all parts of the civilized world, and in the course of a year more than 150 working models of branding machines were submitted to the association for its consideration.

There were only about two models of outstanding merit, and of these the idea worked out by Rees and Wilkinson, two Los Angeles inventors, offered the greatest possibilities. It was this model which finally earned the prize. In addition to the prize money, the association has agreed to pay the inventors another $10,000 in the form of royalty on the basis of $1,000 a year for ten years.

It is obvious that the association wanted a branding machine suited to its needs very badly to offer such a reward for it, and to wait and experiment so long before obtaining it. The association could have worked out some sort of a branding machine in a few years after the start was made that would have done the branding after a fashion, but they were determined to have a machine that would do the work well, and do it economically so that the consumer would not have to pay for being able to identify the association brand, by paying more for the walnuts.

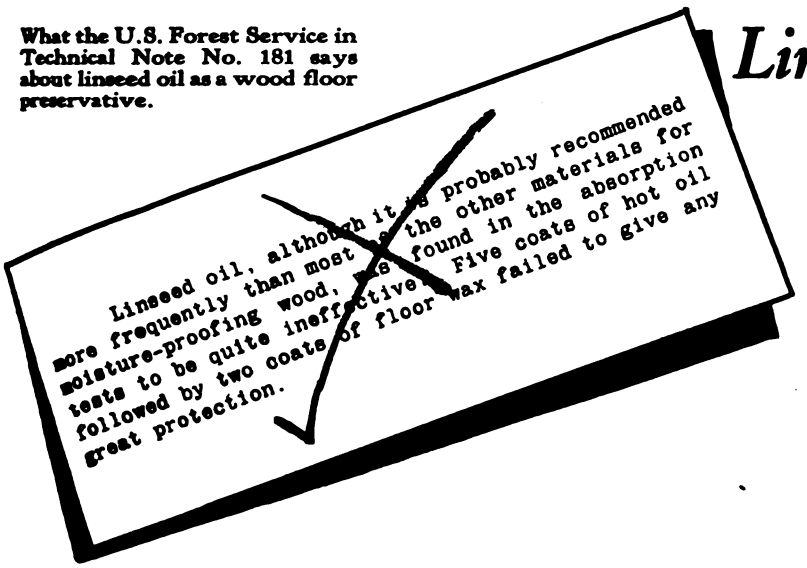
Some idea of the difficulty involved in getting what they wanted may be gained by the fact that even after the inventors had turned out an improved working model the association had to work out two new phases of the mechanism in order to get the desired result. One machinist worked out an entirely new feeder, a service for which he received $5,000, and another man developed a rubber stamp, through a series of experiments extending over two years' time. In doing so he accomplished what others had pronounced a virtual impossibility.

In gradual perfecting of the machine, the question of economical operation was the pivot on which success hinged. Gradually the machine's ability to put the brand on the walnuts was improved, and in just about the same ratio its speed was increased, until it was perfected to the point that it put the little diamond on practically every nut and ran them through at such speed that the cost of branding a pound of nuts—about forty—was one twentieth of a cent. In a standard sack there are approximately 4,000 walnuts. The branding machine brands every walnut in a 100-pound bag for five cents.

After being cleaned and polished the walnuts are elevated from the end of a grading belt into a bin above th

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What the U.S. Forest Service in Technical Note No. 181 says about linseed oil as a wood floor preservative.



Linseed Oil Won't Do

for preserving wood floors—

Says U. S. Forest Service

Shellac Wears Off!

Varnish Wears Off!

Only LIGNOPHOL *Lasts!*

YOU can make your wood floors serve without repairs. You can restore the natural gum and oil of the wood. You can keep them from splintering, rotting, drying out. This goes for either old or new floors.

But there is only one way. It requires Lignophol. Lignophol alone can give you smooth, dustless floors that last for years.

At the loss of many dollars for new floors, many concerns have learned this lesson. Profit by their experience. Save the money that they have lost.

In schools, churches, factories and other important buildings all over the country—Lignophol is being used as a life-saver for wood.

If desired, our own service crew will apply it, though it can be easily and quickly done by any workman. Mail the coupon for complete information.

The wood floors of Columbia University (Lincoln School, Teachers College) are treated with Lignophol.



Architect — Starrett & Van Vleck, N. Y. C.
Builder — Hegeman Harris Co., N. Y. C.

L. SONNEBORN SONS, Inc., 114 Fifth Avenue, New York

LAPIDOLITH

The original concrete floor hardener adds years to the life of concrete floors. This liquid chemical compound is applied like water, with a brush. Hardens over night. Does away with dust and cracks.

CEMCOAT

This paint stays white when others turn yellow. Can be washed again and again. Adheres to brick or concrete as easily as wood. Send for samples.

HYDROCIDE

A complete line of water and dampproofing products for walls, copings, foundations.



Mail this Coupon Today!

COUPON

L. SONNEBORN SONS, Inc., 114 Fifth Ave., New York
Please send me, without obligation, demonstration samples and literature on:—Lapidolith.....; Lignophol.....; Cemcoat.....; Hydrocide Colorless..... (Check products that interest you.)

Name.....
Address.....
Company.....
Position..... I. I. 3

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Haskins HD-4 Die Sinking Equipment

Handy As A Hammer And As Necessary

No metal working plant would deign to get along without some kind of a hammer. Yet hundreds are doing without as basically necessary equipments—Haskins Flexible Shaft Equipments—because they do not actually know what they will do for them in saving many valuable hours.

Just as there is a "right kind of hammer" for each particular job, so there is a right type of Haskins Flexible Shaft Equipment for your particular type of work where it will reduce operation costs from 10 to 50% and more.

Write for a pictured story, "Taking The Tool To The Work," and ask your jobber for complete information.

R. G. HASKINS CO.

Portable Flexible Shaft Machinery

3457 Lake Street Chicago, Illinois

Branch Offices in Principal Cities



Other Exclusive Features of Parker Vises



Swivel Base 360° Gripping Power



Solid Underportion in Slide



Handle Stays Put

which can exert great gripping power or release its load at will, the jaws of a Parker Vise are fitted tight to stay on a lifetime or they can be easily removed if necessary.

Parker vise jaws are made of steel, carefully milled and fitted, and pinned on. Their construction has been a feature of this famous vise for 85 years. Write to W. R. B. for latest catalog.

Meriden, Conn., U. S. A.

GRIP LIKE A GRIZZLY

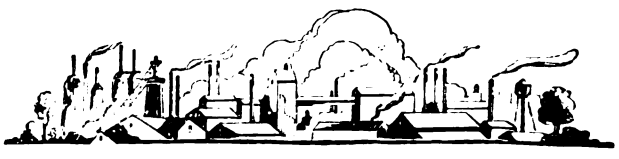
branding machine. They flow by gravity from this bin into a small metal hopper mounted on the top of each machine.

From the slot in the bottom of this hopper they flow down upon an inclined tram or draper, which is an endless belt made up of a series of metallic plates, each having nine depressions arranged in a long row. These depressions make the draper look something like a big muffin pan. Into these depressions the walnuts drop as the draper glides up the incline, the walnuts being about half hidden in their respective cups.

At the top of the incline each row of plates with nine walnuts ranged in a row side by side, pass beneath a roller which consists of nine bars on which the rubber branding devices are fastened. As each row of walnuts glides under the branding rollers, nine rubber stamps are turned by the cylinder until they bear squarely down on the walnuts in the cups, and as the pressure is released by the approach of another raw of stamps the walnuts on which the diamond brand has been placed are tipped out on the sacking belt, as the cups which carried them pass down under the draper on their way around to the feeder for more walnuts.

Each machine is operated by an individual one-half horsepower electric motor, geared to give a speed of twenty-eight revolutions a minute to the branding rollers. This affords a maximum capacity of 2016 walnuts a minute or a carload of 30,000 pounds a day, for each machine.

The time, energy, and money spent in perfecting this mechanism was due to the fact that the association desired an effectual means of identifying its particular brands of walnuts, so they would not be mistaken for foreign products. The association is composed of about 5,000 growers, who grow, harvest, pack and market their walnuts, and who have built up a market through years of effort. Importations of foreign grown walnuts were often of mediocre quality, and were sometimes mistaken for the association's pack. Before getting the branding machine perfected, their only means of identifying their wares was by putting the walnuts in one and two-pound cartons, bearing the association's brand. But it was found that this did not wholly protect them as it was easy to imitate these packages, at least closely enough to deceive the careless purchaser. But with every little walnut bearing the diamond brand of the association, there is no chance of a mistake. The consumer knows what he is buying. The association believes in its wares and is willing to have its reputation rise or fall by the brand on its walnuts. About 95 per cent. of all the walnuts grown in the United States are produced in California with Oregon furnishing about 500 tons a year.



ets not advertised in this issue write Industry Illustrated

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STANDARD TOOL CO.

The "Red Shield" is the latest achievement in the art of Drill making



The chief points of merit are:

"High Speed Steel"
of special analysis
Workmanship
Construction
Ample chip capacity
Size and strength of shank
Uniformity
Temper
Less breakage
More holes
Long service
Less grinding
Less cost per hole

With 46 years' experience

we pronounce the "Red Shield" the best drill yet produced.

It is a combination of Forged and Milled construction with correctly proportioned range of shanks to drive the Drill to fullest capacity.

Designed for all-around heavy duty

The "Red Shield" is imprinted on each Drill.

THE STANDARD TOOL COMPANY

NEW YORK CLEVELAND CHICAGO

Industry lives by Profit!



A Richardson Automatic Dustproof Scale to determine the quantity of bulk Soda Ash and Bicarbonate of Soda produced.

Used by
SOLVAY PROCESS COMPANY
PITTSBURGH PLATE GLASS CO.
MICHIGAN ALKALI CO.
J. B. FORD CO.
DIAMOND ALKALI CO. ET AL.

The profit of most industries depends on Correct weight—of incoming raw material—of material in process—or correct weight of material produced and shipped. Profit is greatest in those industries where essential processes are performed at least expense; i.e., automatically.

RICHARDSON AUTOMATIC SCALES

for

bulk weighing or sacking loose materials **protect the profits of industry.**

If you need a weight of any crushed, granular or powdered materials—if you have any problem of high speed sacking

Call

RICHARDSON SCALE COMPANY

Clifton, New Jersey

NEW YORK BOSTON PITTSBURGH PHILADELPHIA

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A man or a machine—which is more accurate?



Experience has told you that you get the most uniform results by maintaining certain temperatures. Then, isn't it logical to maintain *those* temperatures at all times?

"But," you say, "old Bill Jones looks after the temperature." Perhaps he does. But being human, he is subject to error. Errors are expensive.

Secure *positive,* uniform temperature control with a

SARCO
Temperature Regulator

Sensitive to the slightest variation, the Sarco keeps the "temperature line" level at all times.

The Sarco is a marvel of simplicity and is absolutely automatic in operation. It is entirely free from complicated parts, and requires no outside agencies such as compressed air, water or electricity for its operation.

The low cost of the Sarco is a factor which should influence you to adopt it at once. But even at many times its price, the Sarco would save you money. For it increases production by insuring uniform temperatures and eliminating annoying and costly delays.

Sold on 30 days' free trial

Write for Booklet R-64

SARCO CO., Inc.
183 Madison Ave., New York

Chicago Cleveland Philadelphia
Buffalo Boston Detroit
Peacock Bros, Ltd., Montreal

General Electric Adopts Relief and Loan Plan

A RELIEF and loan plan whereby employees of the General Electric Company, who are temporarily idle, working part time or in need of relief because of illness in the family or other emergencies in the home can borrow up to $200, without intrest, and repay it by deduction in installments of ten per cent. of weekly pay when back on full time again has been inaugurated at the Schenectady, N. Y., works of the company.

This plan originated among the employees and was presented to the company through the works council some time ago. The employees were told then that if a majority, in the employ of the company for one year or more, wanted the plan it would not only be adopted but that, for every dollar put into the relief and loan fund treasury by the employees, the company would put in an additional dollar.

Any employee with the company more than one year is eligible for membership. Fifty cents a month is deducted from each member's pay, five cents going into a relief fund and forty-five cents to be used as an unemployment loan fund.

The General Electric Company will act as custodian of the fund and will allow five per cent. interest thereon. Employee members retired either on a pension or disability relief will be paid the full amount deducted from their wages plus interest at five per cent. per annum for the average time. Members who leave the employ of the company after one year's membership will be refunded the amount deducted from wages less the amount contributed toward the supplementary relief fund.

All loans and disbursements will be administered by a committee composed of an equal representation of employees, elected by the contributors and appointed by the works management.

A New Use for Blueprints

STRANGE are the uses of blueprints. Yet, one would find difficulty in imagining how a blueprint could possibly be used to prove a shortage in transit. Just this, however, did occur when it became necessary to convince an insurance company that had almost every reason to be skeptical.

A foreign consignee reported a shortage in one case of merchandise. In taking up the matter with the insurance adjusters these experts set up the counter claim that the articles shown on the packing list could not have been gotten into the case. As a matter of fact the goods had been packed in a certain way appearing logical to those outside the factory the complete list never could have been packed in the particular case.

It was at this point that the idea of proving the manufacturer's itemizing to be correct occurred. A blueprint was prepared showing exactly how the goods were packed and the diagram won the day. Against it, argument were futile. The blueprint went on to the consignee who with it, had no difficulty in establishing the fact that there was a shortage.

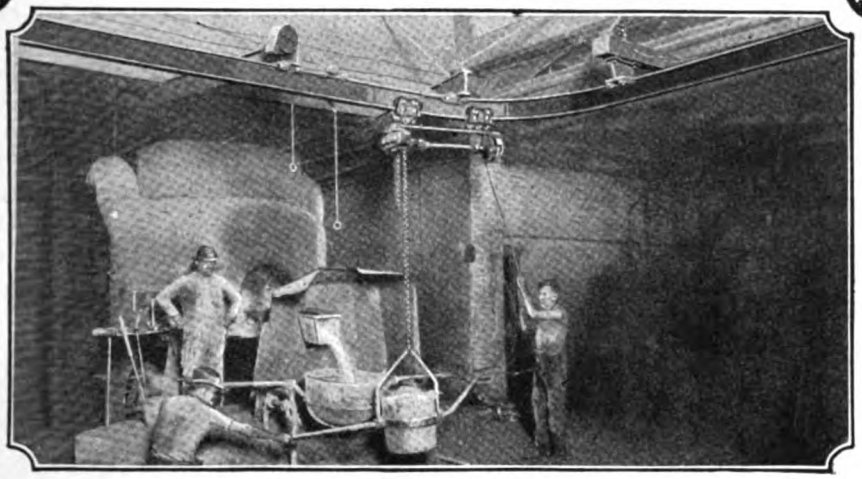
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Don't turn your back on Material Handling Profit-Killers!



Moving should not be 90% of Making!



USE "C-M" IDEAS

WHAT are "C-M" Ideas doing to cut costs; speed up production; make better, safer working conditions, and increase profits? One of thousands of examples is illustrated in the view above taken in the plant of the Poughkeepsie Foundry & Machine Company. An official of this concern states,

"We are much pleased with our "C-M" Monorail System and the way it is working, as it does away with 20 men carrying iron during the pouring period, thereby saving considerable in labor and expense. Besides the saving in labor it makes the work easier for the men. We were compelled to shut down only one day last summer on account of the heat and are positive that we could not have worked so steadily during the hot weather without this system.

"We figure this monorail system paid for itself the first year it was installed and consider it an indispensable part of the foundry equipment."

YOUR material handling conditions may be entirely different from those encountered in the above illustration. But remember that a correct combination of "C-M" Material Handlers can be easily arranged to meet your requirements.

CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

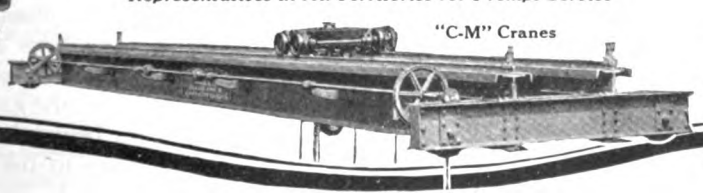


"Cyclone" Hoists

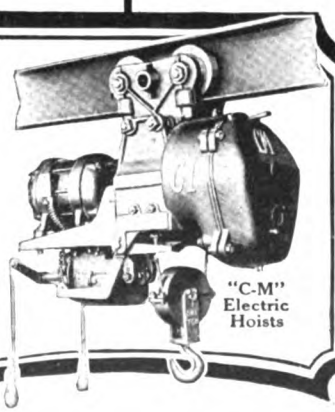
"Matchless" Trolleys

"C-M" is the trademark of a complete line of Overhead Material Handling Equipment backed by an organization ably qualified to apply that equipment correctly to thousands of material-handling conditions. "C-M" Engineering Service is gratis. The "C-M" policy is based on *"Facts* to show YOU the way to MORE PROFIT." Write for particulars.

THE CHISHOLM-MOORE MFG. CO., Cleveland, Ohio
Branches: New York, Chicago, Pittsburgh
Representatives in All Territories for Prompt Service



"C-M" Cranes



"C-M" Electric Hoists

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Even and Clean
as the tooth of a wolf

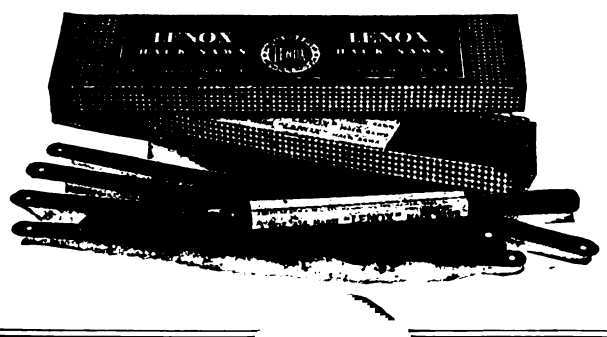
No animal living can do as much damage in as short a time as the steel-jawed, lightning-quick timber wolf. There's no bruising mutilation in his bite; he leaves a slash as even and clean as though it had been cut with a sharp knife.

So it is with Lenox Hack-saw blades; they take their name from the packs of savage marauders that years ago hunted the western shores of Loch Lomond,—the clan stronghold established by the old Earl of Lenox.

As a Lenox blade slips through a bar of steel or malleable iron it leaves a cut as straight and even and clean as the slash of a wolf.

Send for a pack of Lenox Wolves—give them a trial on the hard jobs in your shop. All of them are absolutely alike in quality, workmanship and built-in strength. Just ask for "The Blade In The Plaid Box."

American Saw & Mfg. Co.,
Springfield, Mass.

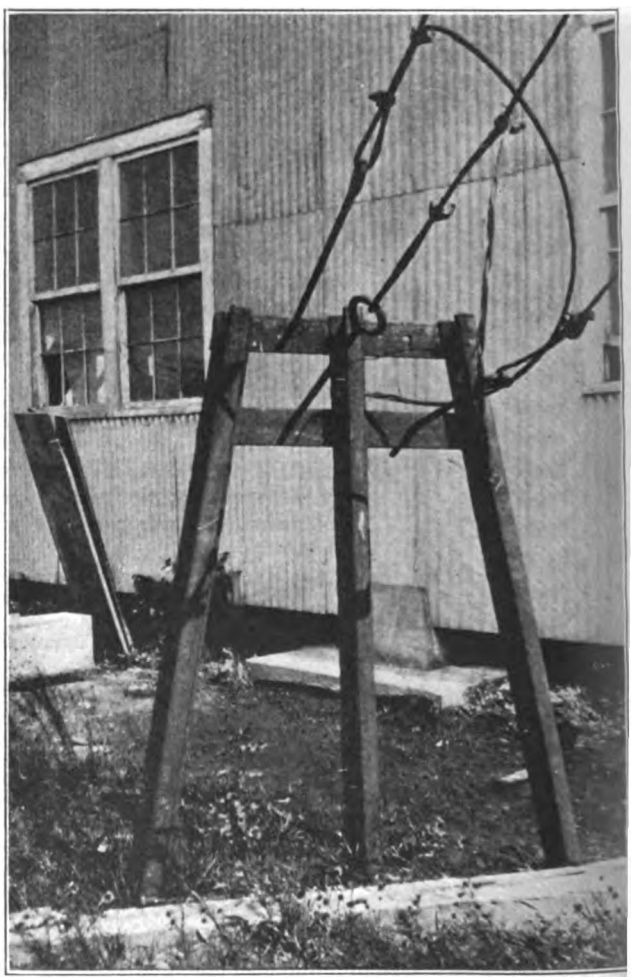


Handy Anchor for Heavy Guy Lines

By L. M. Jordan

THE accompanying illustration shows a very durable anchorage for heavy duty guy lines that has distinctive advantages.

A single section of discarded railway track steel is cut into three equal lengths 10 feet long and these are set in a line in the center of an excavation 5 feet square and 2 feet deep, being driven into the sub-soil. The two outer pieces are inclined at their top ends toward the center one and all three are inclined slightly away from the smoke stack which makes the anchor stronger. After setting the pieces the excavation around them is filled with concrete which prevents them becoming distorted and loose in the earth, due to the force of high winds against the stack. The bottoms of all three pieces are



opposite the stack and two pieces of flat iron ½-in thick and 3 in. wide are bolted to the cross tie flanges the rail. Several ½-in. diameter holes are drill through these. The guy lines are attached to the en of pieces of ½-in. diameter iron rod which have be bent into an eye, as shown, the greater part of the remai ing length of the rods being threaded. These rods passed through the holes in the flat iron of the anch and nuts are attached to the protruding ends.

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Here Is the Solution!

Wouldn't a paint that could be used with equal success for your almost every paint need, appeal to you?

In VALDURA ASPHALT PAINT you have such a preservative. It is absolutely waterproof and weatherproof, and is the ideal paint for industrial requirements.

Great care is taken in the manufacture of VALDURA —only those ingredients which time and exhaustive tests have proved correct, are used in its manufacture. The base is genuine 99.5% pure Gilsonite *natural* asphalt. It is absolutely waterproof, weatherproof, acid and alkali resisting. It spreads twice as far as ordinary paint and lasts from two to five times longer.

All we ask is just one chance to prove VALDURA's supremacy—and at our expense.

AMERICAN ASPHALT PAINT CO.
844 Rush Street **Chicago, Ill.**

Factories: Lincoln, N. J.

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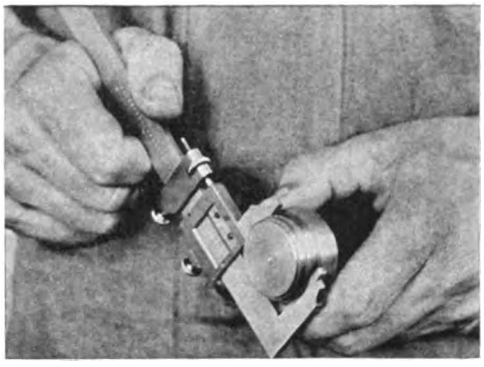


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Are on the Job



If accuracy is an important consideration in your shop, you have a use for these tools that will measure to the fineness of a split hair.

Good tool equipment plays a big part in lowering production costs. Jobs done with accurate tools go through the inspection department with fewer rejections.

Accuracy, durability, and reliability are built into every Brown & Sharpe product.

The Brown & Sharpe Catalog No. 30 is a valuable reference book of good tools. If your dealer cannot furnish a copy, write to us.

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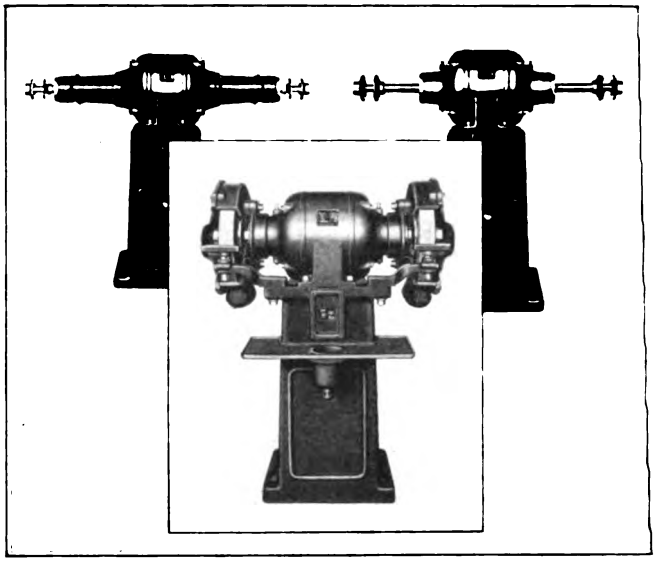
Dept. I

BROWN & SHARPE MFG. CO.

Providence, R. I., U. S. A.

New Double End Grinding and Buffing Machines

THREE new types of motor driven double end grinding, buffing and polishing machines have recently been introduced by the Hisey-Wolf Machine Company, of Cincinnati. These consist of a floor stand grinder, made in five sizes; a floor stand buffing and polishing machine with open type spindles, made in five sizes, and a floor stand buffing made in four sizes. Three of the floor stand grinders, two of the smaller sizes of buffing



and polishing machines and the ten-inch buffing machine are also built with bench base mountings.

All of the machines are available for both alternating and direct current operations. The machines are equipped with improved commutating-type repulsion induction motors, while squirrel-cage motors are supplied for two- and three-phase alternating current. Ball bearings are provided for the grinding or buffing spindles and in case of the buffing machine with the enclosed spindle extensions four ball bearings are supplied.

Home-Made Specialties

By S. W. Frederick

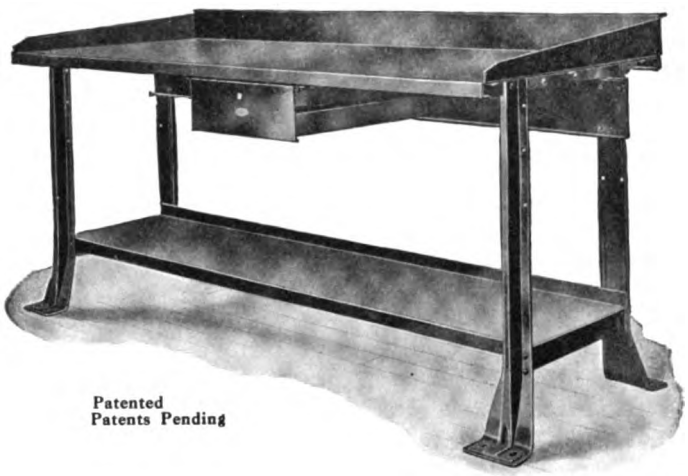
ON LOOKING through a magazine the other day nearly fifty years old, I was interested in reading an advertisement headed, "How to Make a Phonograph"

It struck me as unusually interesting because I had never heard of any one trying to make a phonograph. We of the younger generations have always left that to the manufacturers of phonographs. However, on second thought I recall that when a boy my playmates and I tried to make our own crude bicycles. When the automobile engine was more recently developed we bought castings and tried to make our own engines for driving bicycles and some of us succeeded. I made a small steam turbine. We also made electric dynamos and motors. But all of those crazes are events of the past. And now that the radio is introduced we find that a great many people get more pleasure out of making their own radio sets than they do in listening or in buying them.

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"HALLOWELL" ALL-STEEL Factory Equipment

ready-made benches cost less!



HERE you see a "Hallowell" All-Steel Work Bench that needs no carpenter's costly time. It won't splinter. It can't burn. It's far ahead of any wooden bench for wearing qualities. All-Steel Benches come in various sizes to fit every factory need and *they are always in stock* so you can have them when you want them and in any number, too!

IF you prefer wooden tops—"Hallowell" Steel Bench Legs are at your service. They save time and much money. No bench can get wobbly when built on "Hallowell" Steel Bench Legs.

Our All-Steel Tables, Steel Bench Drawers, with or without locks, and Steel Tool Stands, mounted on casters might be just what you are looking for.

WRITE today for our special folder that gives complete description of these various items and illustrates our All-Steel Benches, too! At the same time, we'll be glad to send you our complete factory equipment catalog.

Write for circulars, to-day!

ndard PRESSED STEEL Co.

Box 8, Jenkintown, Pa.

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They Keep Production "Up" and Floor Repairs "Down"



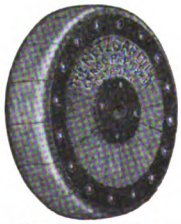
"METZGAR"

Silent floor-saving
END-WOOD
TRUCK and CASTER
WHEELS

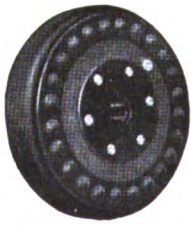
Give Warehouse Trucks, Trailers, Hand Lift and Trailer Trucks and Four-Wheeled Hand Trucks

50% more efficiency!

The butcher-block construction does it.



Regular Duty Wood Bearing



Heavy Duty Hyatt Bearing

Send for booklet, prices, new discounts!

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MICHIGAN
U. S. A.

Alabama Power Company to Have High Speed Excitation

A CONTRACT amounting to approximately $600,000 has been awarded to the Westinghouse Electric and Manufacturing Company by the Alabama Power Company for the complete generating equipment and entire quick response excitation system for installation in a new hydro electric station on the Coosa River. This new development will be known as the Lock 18 plant and will be located near Elmore, Alabama.

Included in this contract are four 29,000-kv-a., 12,000-volt, 100-r. p. m., vertical waterwheel generators, each machine complete with a 570 kv-a., 575-volt direct connected auxiliary generator mounted directly above the thrust bearing of the main alternator and driven from the main shaft. Each 29,000-kv.-a. generator receives its excitation from a specially designed Westinghouse high speed of response motor-generator set and this motor-generator set receives its power from the 570-kv.-a. auxiliary generator. Each 570-kv.-a. auxiliary generator is excited by means of a small direct connected exciter mounted above the auxiliary generator.

Eight special exciter rheostatic generator voltage regulators are included in this contract. These regulators involve a combination of old and new principles giving high speed operation under varying load conditions yet static during steady load conditions.

This installation is the first of its kind in the South in that a quick response excitation system recently developed by the Westinghouse Electric and Manufacturing Company is being furnished to insure maximum transmission stability.

A Large Power Plant Development

ONE of the largest power expansions in recent year in the greater Pittsburgh area will be undertake in the near future as a result of the placing of a second contract for a 48,500 kv-a. turbine-generator unit to b installed at the Colfax Station of the Duquesne Lig Company in Cheswick by the Byllesby Engineering a Management Corporation. This is the most importa power plant operated by the Duquesne Light Compa which, according to the announcement made recent ordered the two huge units from the Westinghouse Ele tric and Manufacturing Company.

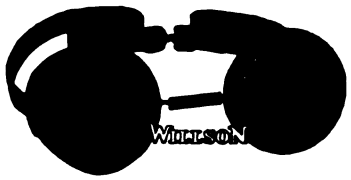
In addition to the two turbine-generators, which w have a combined output of approximately 120,000 el trical horsepower, the contracts call for two steam co densers of 62,500 sq. ft. each as well as a 100,000 kv bank of electrical transformers to operate at 84,300 vo Included in the auxiliary equipment are 26 circuit bre ers, 10 of which set a record for this type of apparat These, having the largest interrupting capacity of breakers ever built, are rated at 2,650,000 kv-a. ruptur capacity, at 11,000 volts. Including the main generat units and all auxiliary equipment, the two contracts for a total outlay of approximately $2,000,000.

At the present time there are in operation at the Col Station four turbine-generator units totaling 210,000 k When installed next year the two additional units raise the generating capacity to a figure approxima 300,000 kv-a., or 400,000 electrical horsepower, making this power plant rank among the foremost st plants anywhere in the world.

oducts not advertised in this issue write Industry Illustrated

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Eye Protection at Its Best



Welding and Cutting Goggle, No. L80. Tough fiber eyecups, adjustable bridge, indirect ventilation, and Industro Glass. $18.00 per dozen, f. o. b.



Electric Welding Helmet No. 130. Strong light-weight fiber. Industro Glass with cover glass—can be changed in an instant. $9.30 each, f. o. b.



Safety Goggle No. LJ31½. For chipping, scaling, rivetting, grinding, etc. Can be standardized for both heavy and light work. Super-Tough Glass. Sweat-proof padding. $17.40 per dozen, f. o. b.

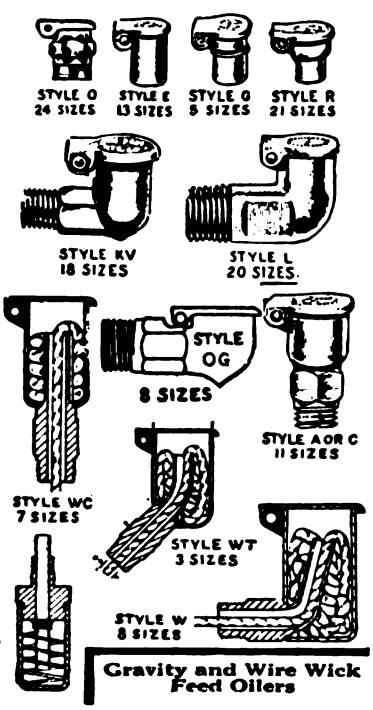
WILLSON GOGGLES, INC., READING, PA.

Manufacturers of safety goggles, welding helmets and handshields, and Dustite Respirators. Types for every industrial need.

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CATALOG 22
Illustrates in actual size and shows sectional drawings with the detailed dimensions of
275 STYLES AND SIZES

GITS BROS.
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GITS BROS. MFG. CO.
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Gravity and Wire Wick Feed Oilers

Survival of the Fittest



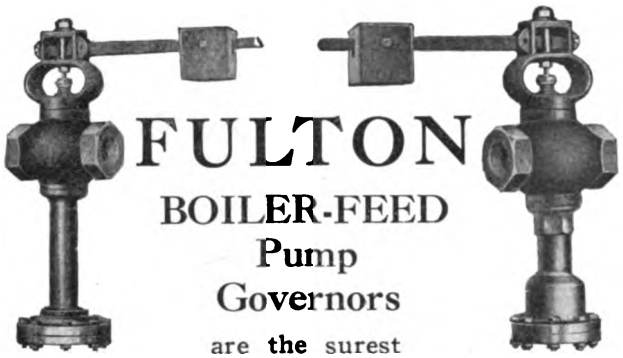
Power blade users today more than ever realize the superior qualities of some blades over others.

After using a great many different makes of blades they have singled down to the use of one blade that lasts the longest with the greatest number of cuttings. And this blade that out performs and out lasts all others is the Victor.

Why not profit by the experience of others and select the Victor blade, saving the cost of experimenting with inferior blades?

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

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proper water supply for boilers

For securing the boilers maximum efficiency these governors should be a part of every BOILER-FEED pump system. They are indispensable with feed water regulators. They are made in two types,—Diaphragm and Piston. Either of these types will prove durable and satisfactory under any kind of BOILER-FEED service conditions.

We would like to send you the details.

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28-36 Penn Ave., Pittsburgh, Pa.



MORE than 64% of the manufacturers who exhibited the 45 different cars appearing at the National New York Automobile Show in January use Oakite materials in their plants.

Among them are the foremost and largest automobile manufacturers in the world today. They use Oakite materials and methods in cleaning, cutting, grinding, stamping or rust prevention operations because it PAYS them to do so.

Whatever the nature of your business, by using OAKITE cleaning materials, and the service back of them, you too can benefit the SAME way as they have through simplified handling, uninterrupted production, improved quality and lower costs.

Get in touch with us now, or write for booklets pertaining to your work.

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Industrial Cleaning ... and Methods

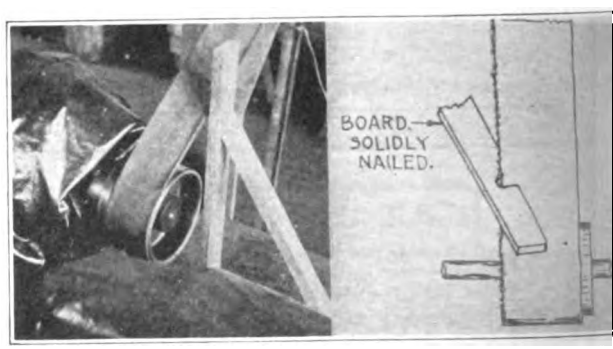
Treating Belts Rough

By W. F. Schaphorst

WHILE visiting a plant not long ago I saw a drive similar to the accompanying sketch. This sketch in itself tells the old, old story. Nobody in the plant was really "responsible" for the belt. Everybody was in charge. Both of these last sentences mean the same thing for they are merely a restatement of the well known adage: "Everybody's business is nobody's business." The pulleys had not been lined up correctly and as a result the belt would not stay on the pulleys of its own accord. To compel the belt to stay on the pulleys a board about four inches wide was securely nailed to a post in such a way as to make the edge of the board bear against the edge of the belt and keep the latter on the pulley.

The condition of the board when sketched makes it evident that the board had been in the position for some time. It was nearly worn through and the belt was no running on the center of the pulleys any more. This sketch is no exaggeration; it shows that the belt had worn through only half way whereas it was worn nearly the entire distance through.

Needless to say the edge of the onetime good leather belt was in a ragged condition as I have endeavored to indicate.



No engineer, belt man, manager, superintendent, owner, or anybody else should ever permit such a drive for even a single day, say nothing of year after year. A drive of this kind is bound to cause incessant trouble. Power is lost due to the constant friction. The belt is ruined prematurely and leather belts are too expensive to be treated in this way. Time is lost nailing up new boards as fast as the old ones wear through. Additional power is lost because of friction due to the unnatural position of the belt on the driving and driven pulley. As soon as any important belt gets out of line—line it up. That is the only remedy and it is the proper one. Never start a new belt on pulleys that are misaligned.

The photograph was taken of a similar instance where pulleys were not correctly aligned and where a "two by four" was made to bear against the belt and keep it in place. The photograph plainly shows how the edge of the belt was ruined owing to this improper forcing of position. The electric motor partially shown in the picture, drives an overhead lineshaft. It would have been a simple matter to shift the motor slightly so the alignment was right.

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FAMOUS SEXTETTES

6-FAMOUS INVENTORS



SIR HENRY BESSEMER



JOHANNES GUTENBERG



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6-FAMOUS TOOLS



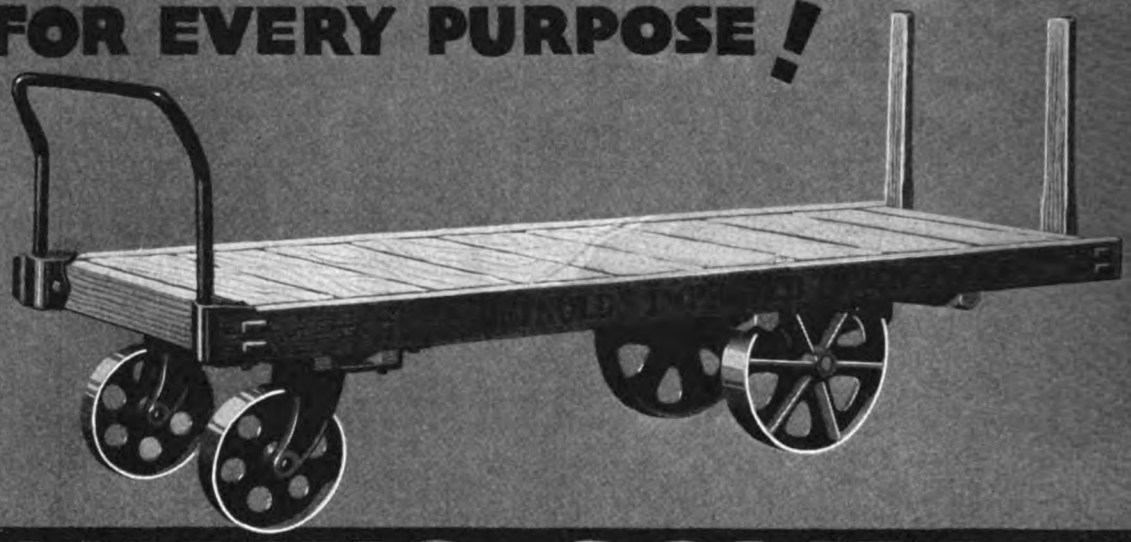
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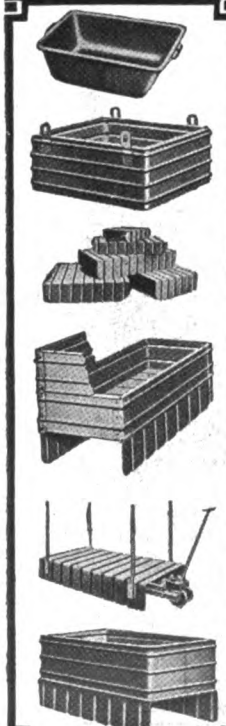
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PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



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THE leadership of the POWELL Line rests not only upon its completeness, but is due also to the fact that each POWELL Pressed Steel product is a step ahead. We are specialists in the production of efficient, practical, lasting Pressed Steel Material Handling Equipment, that makes real economy a fact in hundreds of plants, large and small.

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Symmetry and Long Life



The Parthenon of Ancient Greece is considered a masterpiece of architecture because of its pleasing lines and its ability to resist the ravages of time.

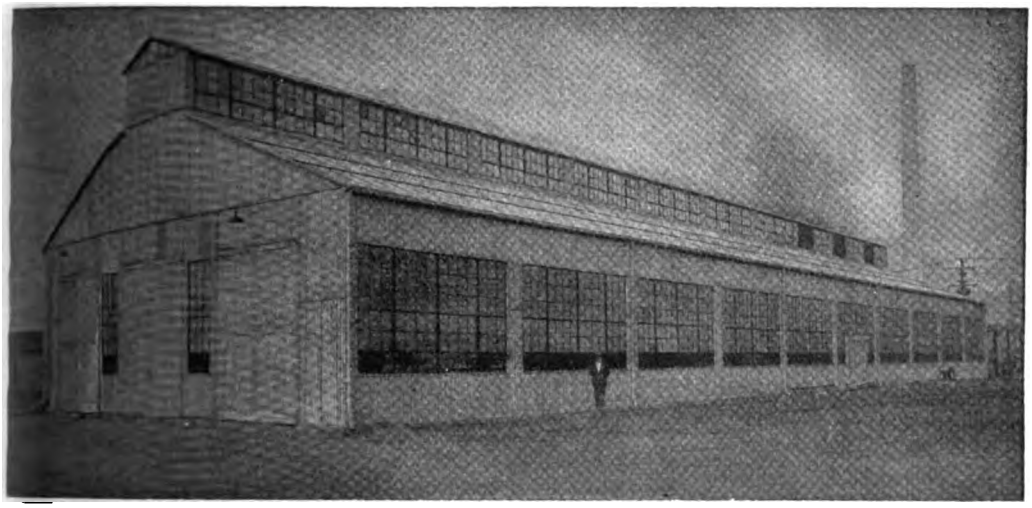
MASTER GUARANTEED MOTORS have earned a similar reputation in the small motor field because of their balanced proportions, their hard, mirror-black, enamel finish and their ability to give years of satisfactory service.

THE MASTER ELECTRIC COMPANY
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STOCKS CARRIED IN PRINCIPAL CITIES
MASTER GUARANTEED MOTORS
⅛ TO 7½ H.P. THE MASTER ELECTRIC CO. Dayton Ohio Less than 40°

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A Maryland Metal Building, Citico Terminal, Southern Railway, Chattanooga, Tenn. Size 60x200.

THERE'S practically no limit to the uses and the adaptability of Maryland Metal Buildings in the industrial field. Low investment, minimum maintenance cost, permanency—these are the factors which make them ***most*** practical for office, factory, powerhouse, warehouse, garage — in short, every instance where additional working or storage space is needed.

A Maryland Metal Building can be erected quickly and without expensive labor. It can be altered or enlarged without loss. It is fire resistant and lightning proof.

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The Corrosion-Resisting Alloy

insures a lifetime of service and places these buildings in a class beyond comparison.

A complete Engineering Department is maintained for your assistance and you are invited to make use of its service (without cost) in determining the most satisfactory solution of your space problems. You are under no obligation whatever. Write today for Catalogue.

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"Moving is 90% of Making"

Whiting Cranes are Moving Many Products in Many Industries — What application are you overlooking?





1 Handling a product in process in a machine shop.

3 Lifting heavy parts of special machinery in a power house.





2 Handling ladles, closing flasks, drawing patterns, etc., in a foundry.

4 Handling rolls of paper.



There is a Whiting Crane for every service



5 Piling lumber and loading it again.

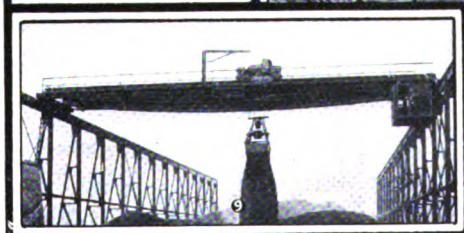
7 Handling blocks of stone or marble.



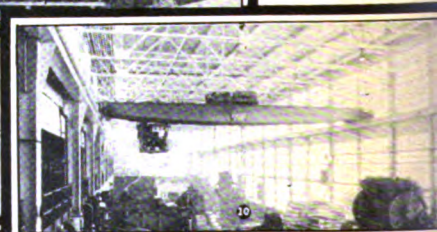


6 Unloading and storing coal.

8 Lifting bars, rods, shapes, scrap, pig, etc., with a magnet.



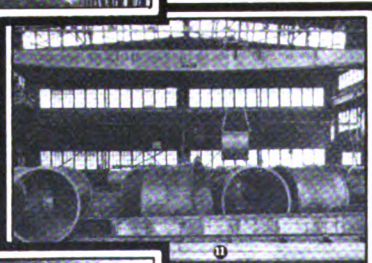
3—250 Tons—all types
Electric or hand power travelers
Gantry, jib, pillar, Bucket Handling, etc.



9 Handling loose materials such as cement clinker with a clam-shell bucket.

11 Assembling plates and structural members.

13 High piling in an auto body shop.





10 Serving bi presses, punche and other tool

12 Unloadin freight cars.

14 Rapid loadin and unloadin at a warehous



Whiting Corporation,
15637 Lathrop Avenue
Harvey, Ill.,
(Chicago Suburb)



WHITING

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OSBORN

Announcing The New Osborn Bass Broom

An upright fibre broom—lighter, easier to handle and virtually indestructible.

The construction of this new broom is unique. The fibre is held in a one-piece seamless steel cap which is shrunk under tremendous pressure around the fibre. The cap is nailed to further clinch the fibre and as an added protection against loosening, it is filled with a special cement.

The handle is held by the close-fitting collar of the steel cap, and is securely fastened with two heavy rivets.

Longer wear—greater toughness—and the ability to sweep easily and thoroughly—make this new Osborn Bass Broom a leader.

You will recognize a value that leaves no question as to the marked economy of this new Osborn broom. Let us quote you.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Avenue Cleveland, Ohio

Three Grades

The *Coarse* broom is particularly designed for railroad track and heavy duty sweeping. It can be supplied with a chisel handle and one wire band.

The *Medium* grade is perfect for general factory and warehouse sweeping.

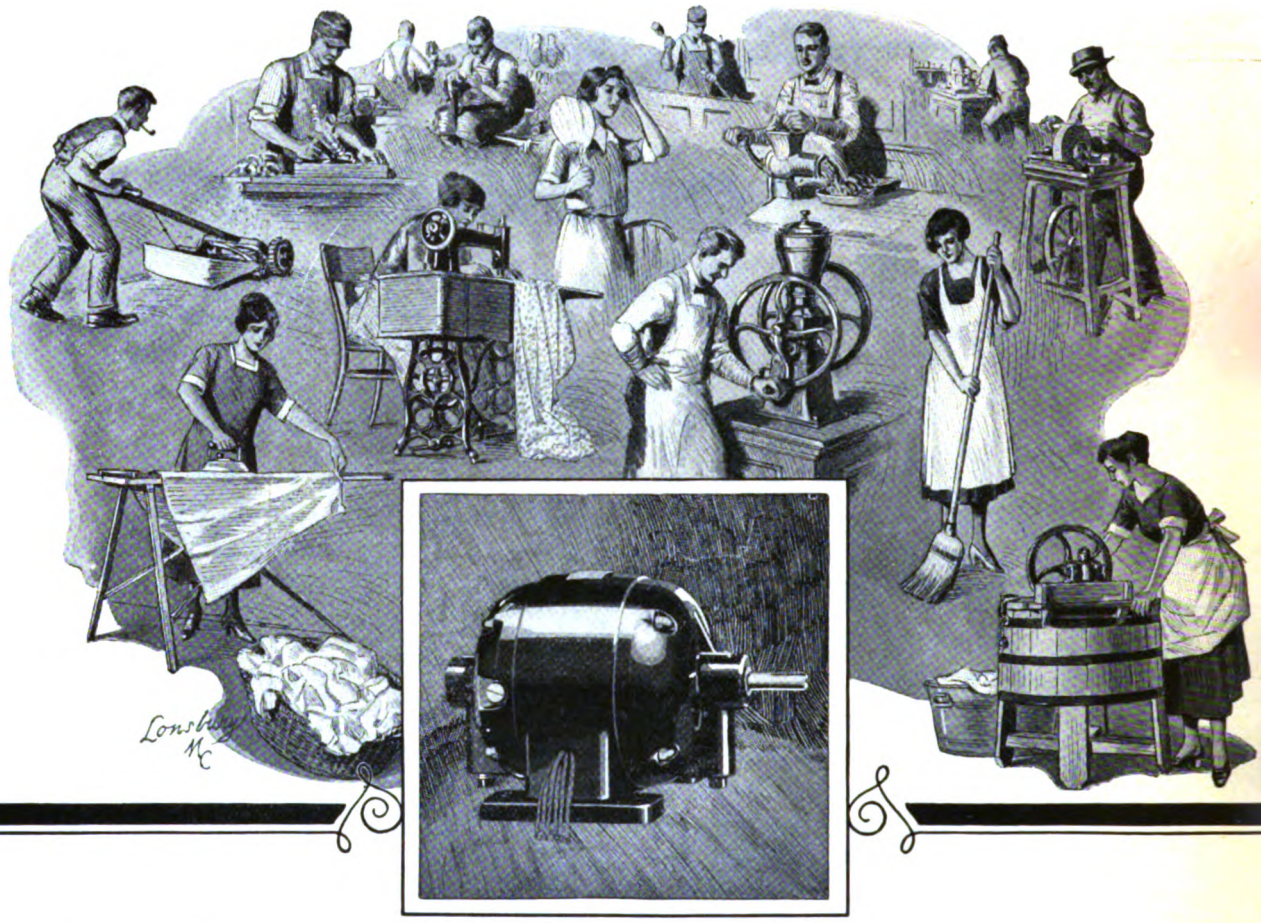
The *Fine* grade is ideal for lighter work—it is more flexible and sweeps clean.



Osborn Brushes

MAKERS OF QUALITY BRUSHES SINCE 1892

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Industry's Biggest "Little Thing"

Gone are the mazes of belts and shafts that made jungles of our factories. Gone—or going—is the day of hand-power in household and industrial tasks.

Individual electric motors, fractional horsepower motors, have come into their own—the biggest "little thing" in business—speeding up processes, cutting costs, increasing output, banishing irksome domestic duties, extending the benefits of time and labor-saving appliances to more millions every year.



For protection from overload — the Domestic Automatic Safety Switch

In opening up new and profitable fields for manufacturers and dealers, to the benefit of the public, Domestic Electric motors have rendered a unique and spectacular service. Every Domestic motor is specifically engineered and built for the purpose it is to serve; every Domestic motor is a special motor; every Domestic representative is a consulting expert—without the expected price penalty. Details of a service and policy exclusive to this company will interest every builder and distributor of electrical appliances. A request will promptly bring this information.

THE DOMESTIC ELECTRIC COMPANY

7209-25 St. Clair Ave. Cleveland, Ohio

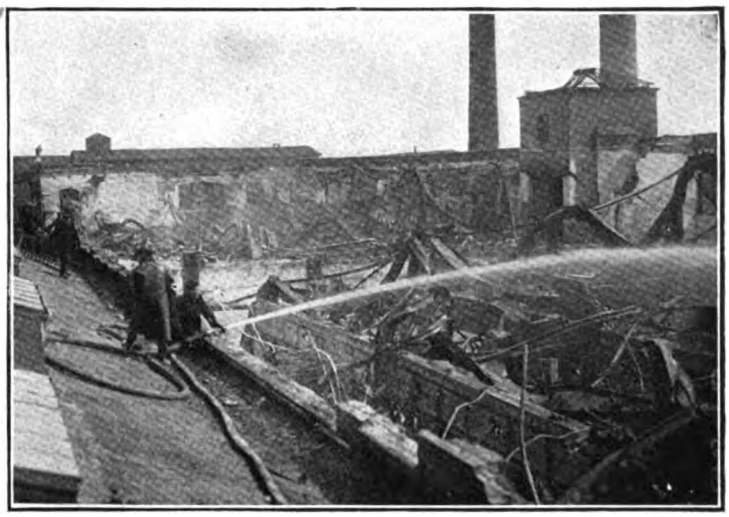
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Manufacturers of fractional horsepower motors exclusively

Domestic Electric Motors

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Wiped out overnight!



Could You Rebuild?

Many do not—even though "fully" covered by insurance



A standard 100,000-gallon Horton ellipsoidal-bottom tank supplying a sprinkler system at the Federal Shipbuilding and Dry Dock Company, Kearny, New Jersey.

WHY face such a problem when you can so easily provide certain protection with a good sprinkler system served from a Horton elevated tank.

Every night brings fire hazard into your plant. Only a brief delay in discovery or giving the alarm may result in damage that will wreck production schedules, sacrifice valuable business, and disrupt a carefully developed organization.

Depend on a gravity water supply

Make sure you are protected. Install a sprinkler system and see that it is supplied by elevated storage in an economical long-lived Horton steel tank.

Full information and quotations on request.

CHICAGO BRIDGE & IRON WORKS

Chicago.....2465 Old Colony Bldg.
New York .....3169 Hudson Terminal Bldg.
Cleveland.....2238 Union Trust Bldg.
Dallas .....1658 Praetorian Bldg.
Atlanta.....1023 Healey Bldg.
San Francisco.....1043 Rialto Bldg.
Havana, Cuba.....Apartado 2507

HORTON TANKS

113-Gray

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Pop Thinks It Is All Monkey Business



"Listen, Lad—

profits and orders are too meager right now to permit of any *trials.*

I've been thinking hard on the subject you're so often bringing up . . . that of substituting steel Stable-Arc Welded for cast iron in our machines . . . *and I don't think that this is any time to monkey with production."*

"No, Pop—

. . . you just *think* that you've be thinking when all you've been doing is r arranging your prejudices.

If you had been *thinking,* you would ha ascertained how many firms in our line ha abandoned castings and profited from S ble-Arc welding. If you had been *thinki* you would have written for that book in t lower corner."

Now let's *do* some thinking! For up-to-t minute information on production weld write to Dept. 18-3.

A new textbook on Arc Welding (price $1.50) will be sent on approval for five days to any executive requesting it.

Book size	6 x 9 in.
Total pages	160
Number of illustrations	200
Charts	62
Divisions	8

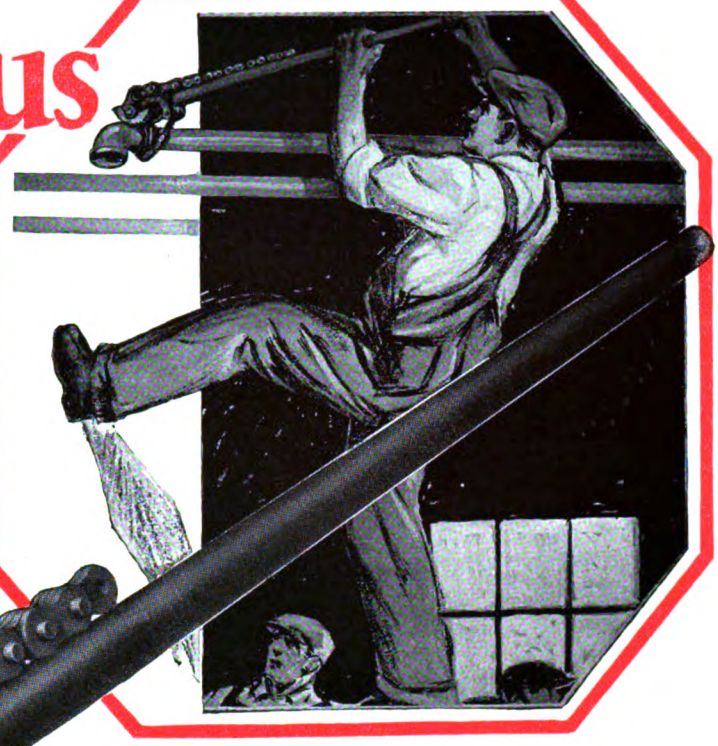
The Lincoln Electric Co., Cleveland, Ohio

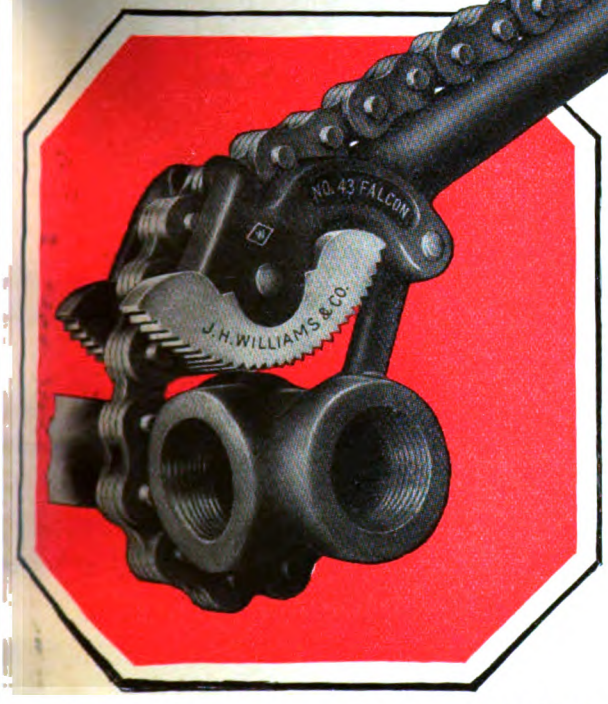
"Stable Arc"

LINCOLN WELDE

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Tremendous strength on both pipe and fittings





CALL it the strength of a giant—tremendous—what you will, Williams' "Falcon" Pipe and Fittings Tongs has it.

That's one advantage. Here's another. The double-ended reversible jaw includes continuous teeth across its center portion. Result? A double purpose tool equally efficient on pipe and fittings—actually two tools at the price of one.

More, it offers a choice of three or four grip-positions on each size of pipe, assuring minimum wear on individual teeth.

Chain—either Flat Link (illustrated), or Cable.

Literature sent upon request.

J. H. WILLIAMS & CO.

"The Wrench People"

New York BUFFALO Chicago

WILLIAMS

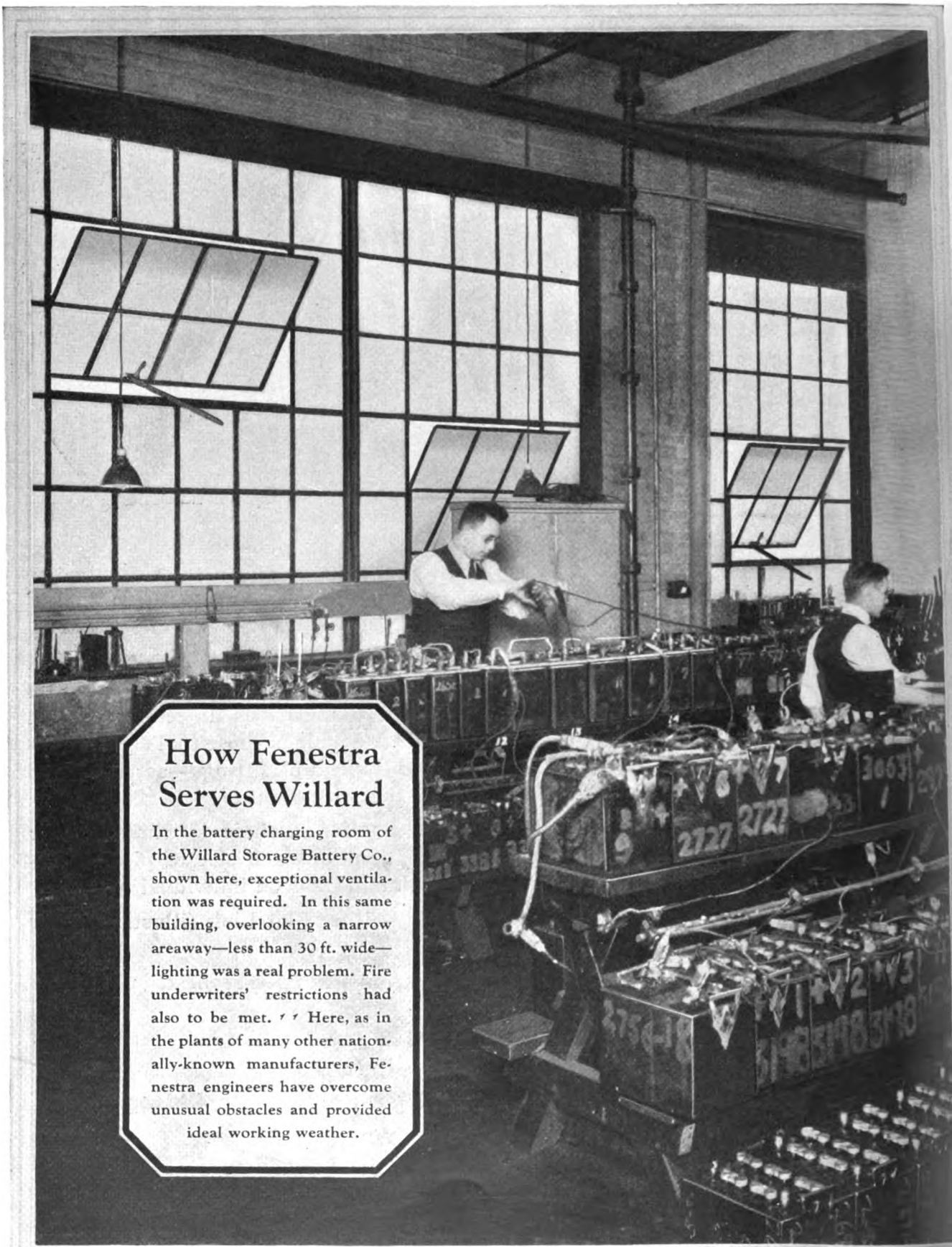
SUPERIOR DROP-FORGED TOOLS

"FALCON"

Pipe and Fittings Tongs

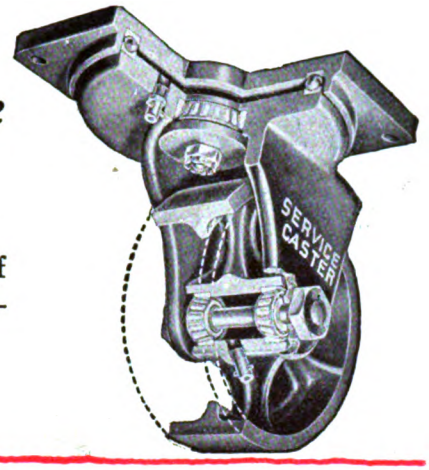
With Proof-tested Chain

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A Powerful Caster that gives Longer Life and Better Service



That is one of the big reasons for the success of SERVICE Trailer Trucks. This caster is especially built for

SERVICE Trailers-Trucks

Equipped with the Famous certified Malleable SERVICE Casters and Wheels --

they aid in quicker, easier handling for every load that trails.

SERVICE Casters have wheels swung on standard Timken Bearings. They swivel on steel balls and are fitted with a Timken Bearing to absorb side-thrust. They are made for the hardest service that any industrial plant can give a truck or trailer.

Made by the same company that builds the "BIG MIKE" Tri-Wheel Truck.

Send for prices and complete information.



Service Caster & Truck Company
519 No. Albion St. Albion, Mich.



SERVICE CASTERS TRUCKS

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The Reserve Powe

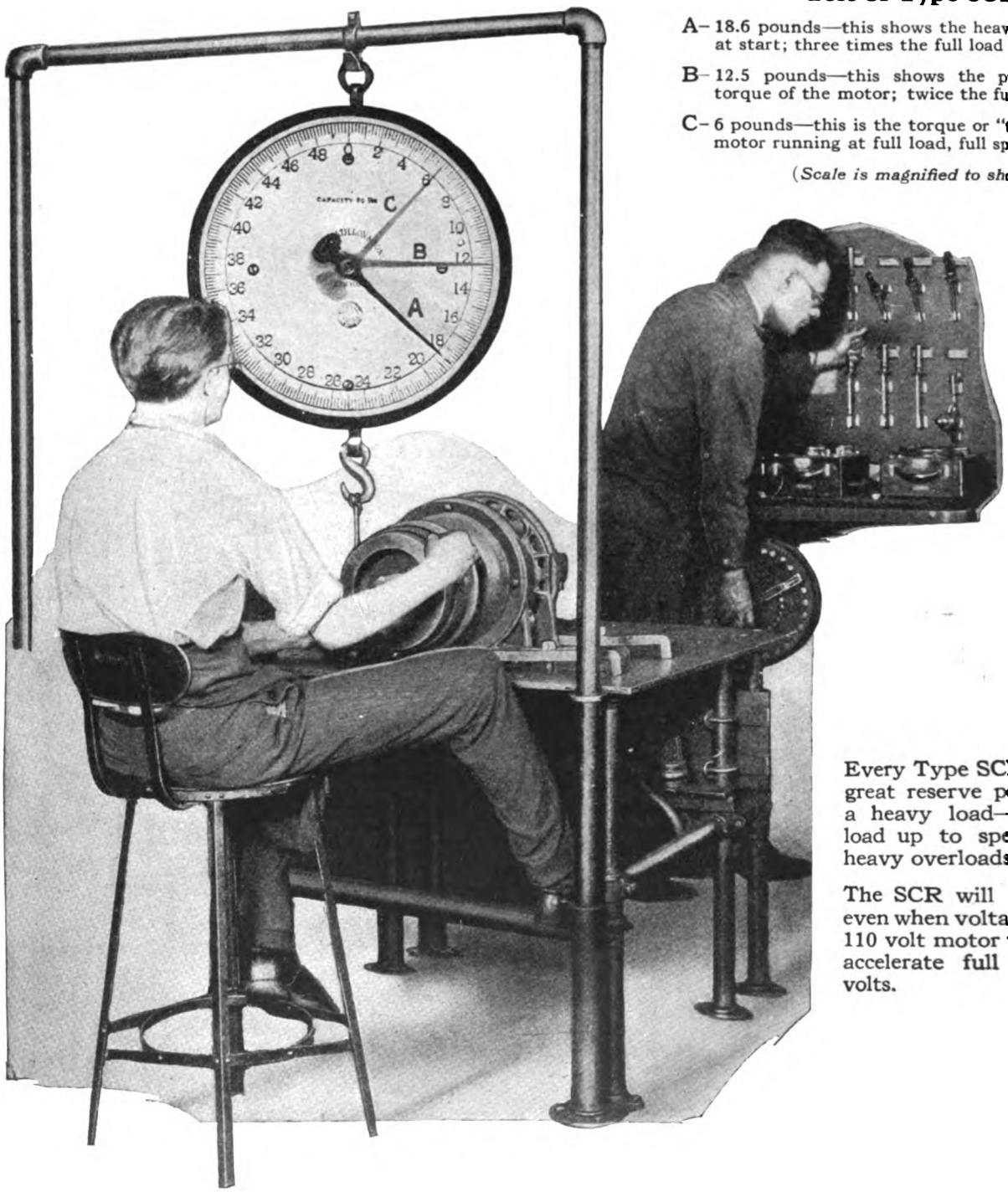
Test of Type SCR Motor

A– 18.6 pounds—this shows the heavy pull of the at start; three times the full load value.

B– 12.5 pounds—this shows the pull-up and p torque of the motor; twice the full load torque.

C– 6 pounds—this is the torque or "twist" on pull motor running at full load, full speed.

(*Scale is magnified to show readings*)



Every Type SCR Motor h great reserve power to st a heavy load—to bring load up to speed—to ca heavy overloads.

The SCR will do its wo even when voltage is low— 110 volt motor will start accelerate full load on volts.

GENERAL

GENERAL ELECT MPANY, SCHENECTADY, NEW YO

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Single Phase Motor
Type SCR

Users of the Type SCR Motor say—

"Far superior to any single-phase motor we have had any experience with."

"Installed on all kinds of hard drive —not one complaint."

"Meets every requisite of the highest class of single-phase motor."

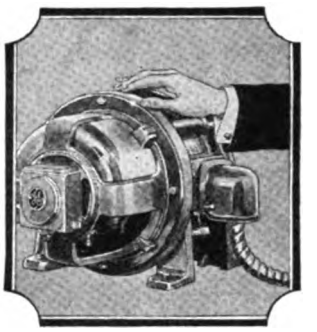
"It is the best single-phase motor ever built, so far as I know."

"I claim it is a wonder—I can't say too much for it."

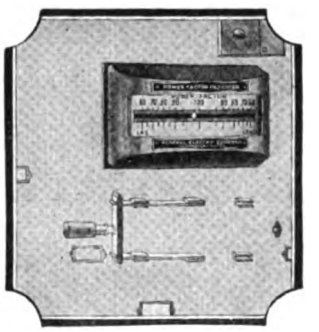
"Just about perfect—the G-E may well be proud."

"Fully up to the mark set by other G-E products."

Full information at your nearest G-E office—or G-E Motor Dealer



The SCR is cool running



The SCR operates at high power-factor—near 100%



The SCR is quiet—starting and running

Apply the proper G-E Motor and the correct G-E Controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. "Built in" or connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.

MOTORIZED POWER
-fitted to every need

7R-2

ELECTRIC

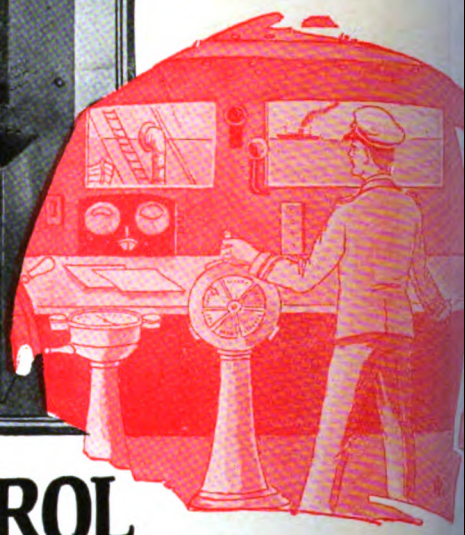
OFFICES IN ALL PRINCIPAL CITIES

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The ship's captain has, withi
arm's reach, complete contr
of the movements of the vesse

U-RE-LITE distribution ce
ters embody this same in
portant principle — *concen
trated control.*



CONCENTRATED CONTROL

DISTRIBUTION U-RE-LITE CENTERS

U-RE-LITE Distribution Switchboards insure simple, efficient, concentrated power control for factories, power plants, hotels, office buildings and other institutions. Unit construction makes it easy to install additional U-RE-LITES to take care of any future change in power requirements.

U-RE-LITE gives you full automatic protection against overloads and "shorts." It increases production and adequately protects your plant and equipment. It safeguards your employees, not only from coming in contact with live parts but also from the temptation of abusing motors and machines by over-fusing.

It is a piece of equipment that carries its rated load year in and year out **with no undue heating. It does not permit itself to be closed in against an overload or "short." It protects both the line and the motor against the burn-out trouble due to single phasing.**

It reduces upkeep expense to a minimum.

U-RE-LITE is, in truth, the finest piece of electrical protective equipment on the market today.



**The Handbook of t
U-RE-LITE contains 96 pa
of illustrated facts on "fo
proof" protection. It simpli
the problem of power cont
all down the line. Copies
this book will be mailed f
on request.**

CUTTER

U-RE-LITE I-T-E CIRCUIT BREAKE

THE CUTTER C *Established in 1888*—PHILADELPHIA, PENNSYLVA

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BRINGING THE TEMPERATURE TO YOU



MOTOCO
INDUSTRIAL THERMOMETER

In and around the power plant temperature plays a most significant role. Yet, as in the theatre, the full meaning of that role is dependent on the success with which the message is put across to you.

The Motoco Industrial Thermometer brings the temperature directly to you, so that you get the full message with ease, accurately.

By bridging the adverse conditions under which temperature readings are usually taken, the Motoco relieves in large measure the difficulties incident to any operation involving close and constant checking. See Catalog No. 9.

The Moto Meter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.

Chicago Office, 820 Tower Court
The Moto Meter Co. of Canada, Ltd., Hamilton, Ont.
National Gauge & Equipment Division, La Crosse, Wisc.

The Industrial Division offers the services of its engineering staff to manufacturers requiring thermometer equipment.

The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

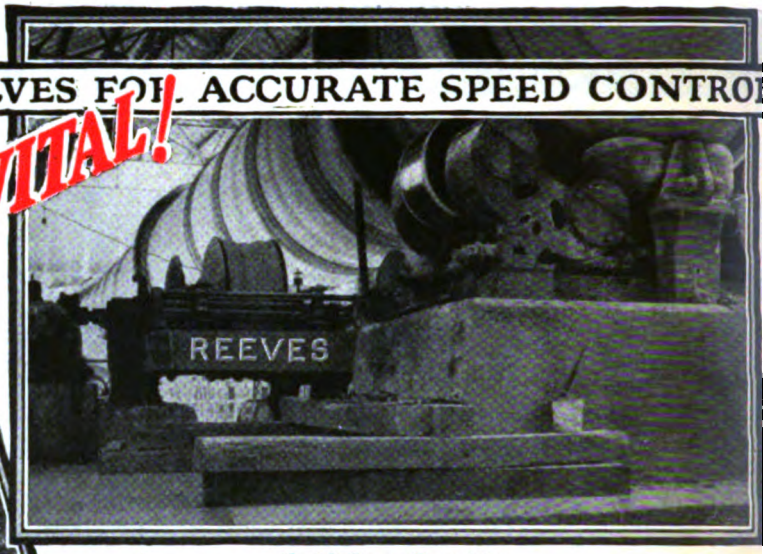
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INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

Speed Flexibility is VITAL!

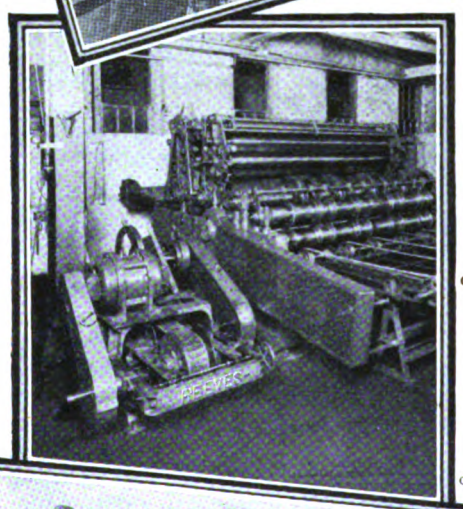


The REEVES driving a continuous paint conveyor

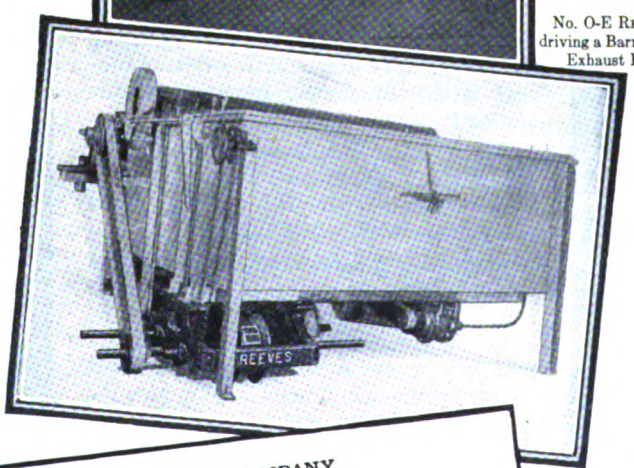


No. 9-D REEVES Transmission driving a lime kiln.

Single-Speed Machinery is Efficiency's Worst Enemy



A REEVES-driven corrugated printing press



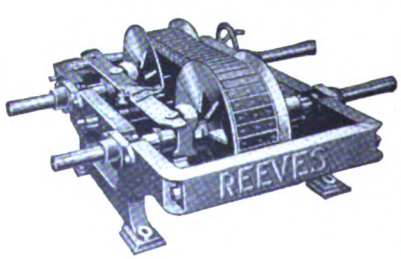
No. O-E REEVES driving a Barngrover Exhaust Box

FOR EXAMPLE, take a production machine or conveyor right in your own plant. Suppose the power fluctuates when you want to run the machine at a steady, even speed. How do you *keep* the speed you need?

Or, suppose the machine is called upon to perform different operations under different operating conditions. *There is one best and most efficient speed for each operation under each condition.* And with single-speed machinery, it is impossible to get that one best speed.

Speed flexibility is VITAL! You must be able to run your production machines and conveyors at *any speed you desire.* To operate them efficiently, you must have absolute and accurate variable speed control. The REEVES Transmission represents the only method by which you can get *any* speed on *any* machine at *any* time. Write us today for all the facts.

REEVES
Variable Speed Transmission



The REEVES Transmission represents the *only* method which gives you absolute and complete control over the speed of your machines and conveyors. It is a simple, inexpensive device which receives power at a constant speed and delivers it at *any* speed desired. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. Accurate and dependable, always.

REEVES PULLEY COMPANY
Columbus, Indiana

- ☐ Send me detailed information about the REEVES in the.....industry.
- ☐ Send me your new catalog G-66, the authority on speed flexibility.
- ☐ Tell me the economical advantages of the REEVES over a variable speed motor.

Name_____

Address_____

City_____

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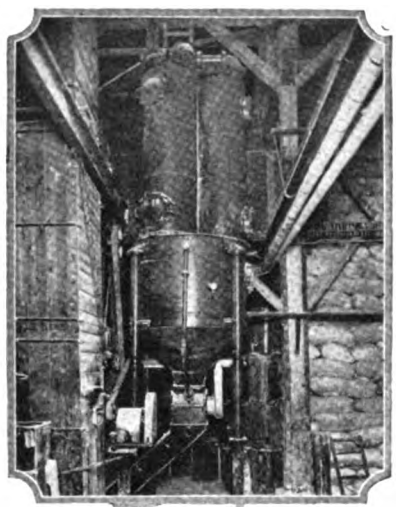
One Man Handles Soda Ash Over a Distance of 125 Feet

A manufacturer of soap and toilet preparations, in fact, one of the largest and best known in the field, now handles soda ash pneumatically, the DRACCO way.

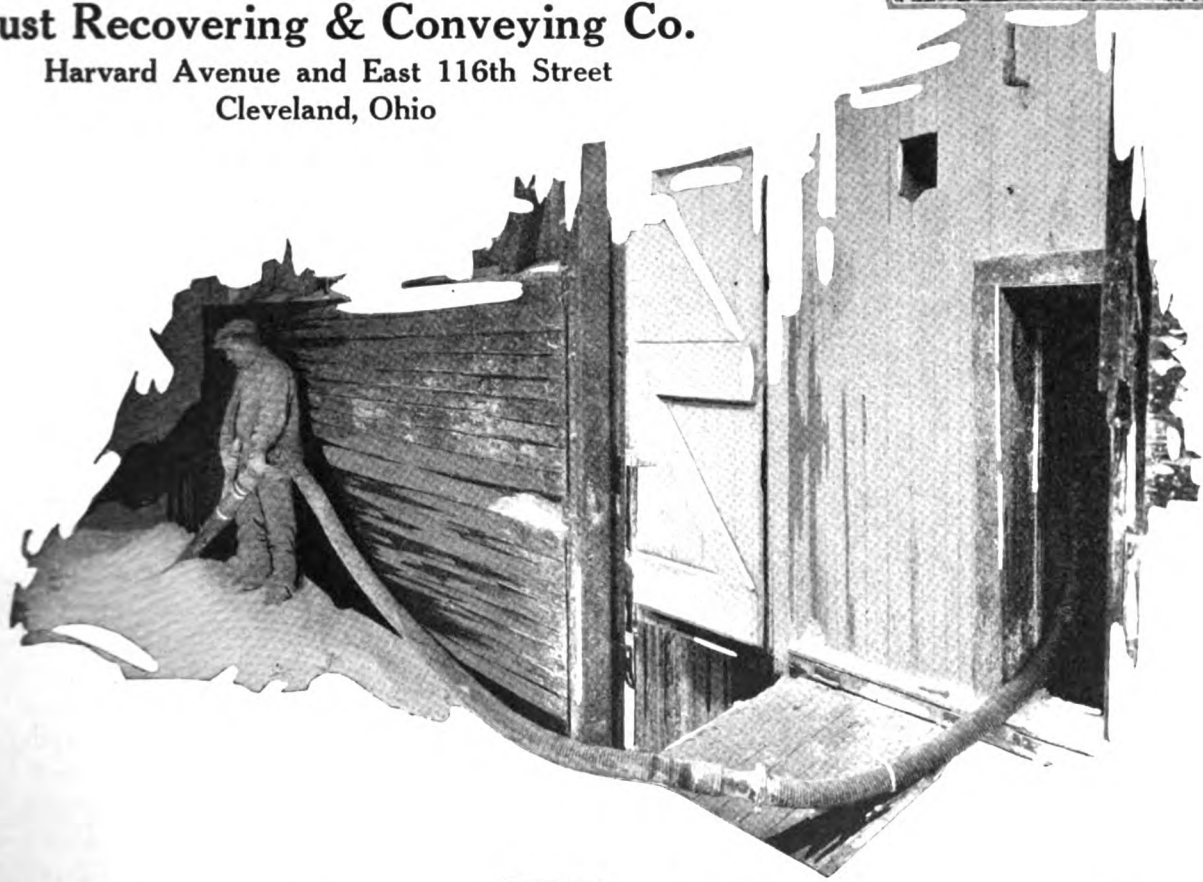
Formerly, a big gang was required and the conditions proved injurious to the health of the workers.

The DRACCO System installed here requires but one man to do the entire handling from cars to bins and the soda ash is conveyed at the rate of 10 tons per hour without a particle being wasted.

DRACCO Systems handle all kinds of bulk, granular and dusty materials. We have a number of bulletins describing various DRACCO installations, which will gladly be sent on request. No obligation.

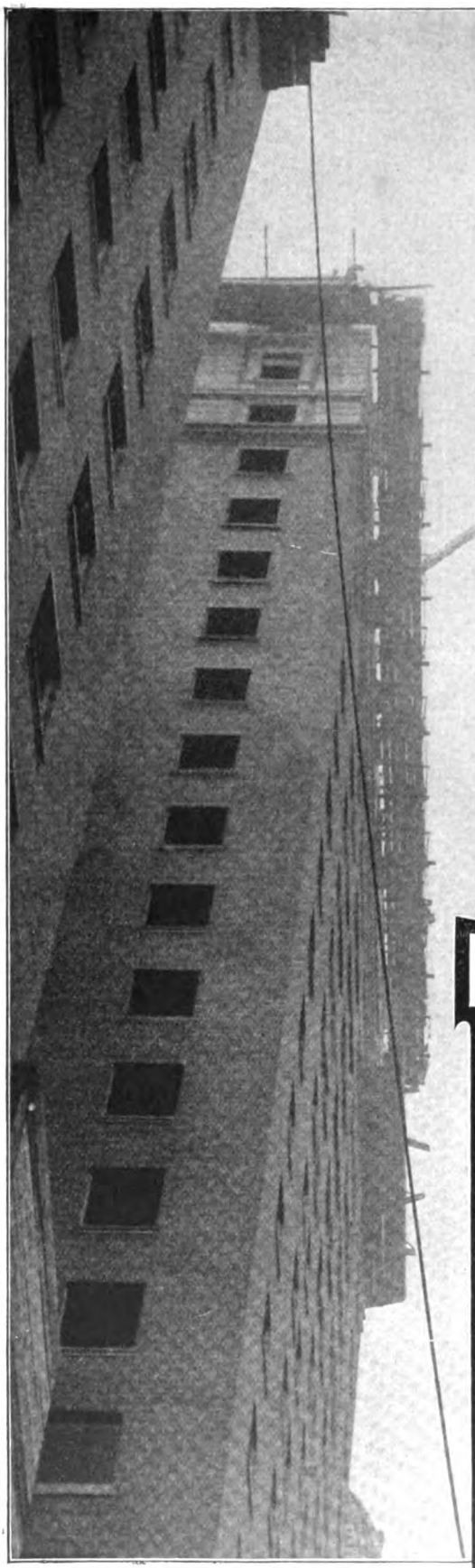


Dust Recovering & Conveying Co.
Harvard Avenue and East 116th Street
Cleveland, Ohio



DRACCO DOES IT

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FOREMAN MACKAY

The Archer Store Setting Co., used thousands of feet of

WILLIAMSPORT WIRE ROPE

Telfax Tape Marked
Factory Certified

in the construction of the Stevens Hotel in Chicago, Ill.

In most of the large buildings erected in Chicago, Williamsport Wire Rope was used extensively.

You too can afford to be **sure.** You cannot afford to be any other way in using Wire Rope. Sure of the Tensile Strength—the Grade you are putting into service.

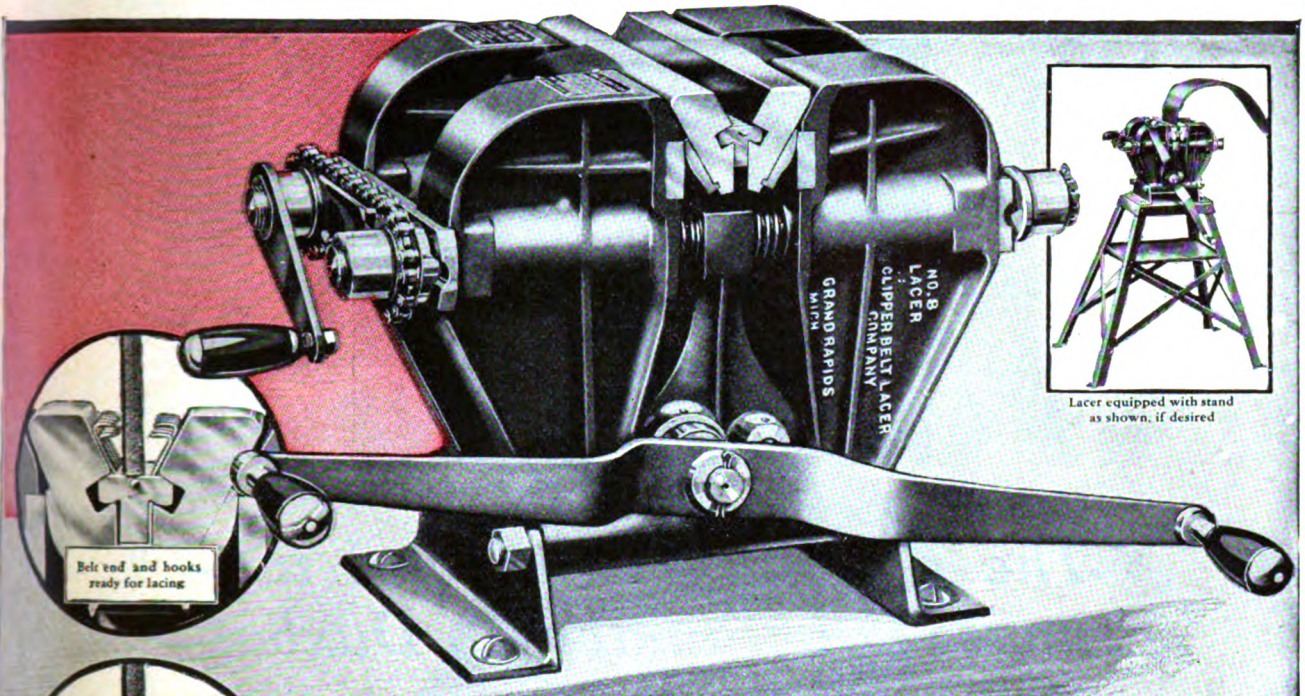
Williamsport gives you this priceless protection in all grades—no other make of Wire Rope does. Why—take a chance?

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works: Williamsport, Pa.

General Sales Offices: Peoples Gas Bldg., Chicago

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Lacer equipped with stand as shown, if desired

Belt end and hooks ready for lacing



Perfectly aligned hooks entering belt



Ready for final clinching



Hooks imbedded flush with surface of belt

A New Clipper Lacer!

Laces Both Ends of an Eight-Inch Belt in 1½ Minutes

A THREE-QUARTER turn of the crank—and the powerful jaws of this new lacer force a row of Clipper Hooks cleanly and uniformly into an eight-inch belt. Less than 1½ minutes is required to lace both ends of a belt.

A pressure of 45,900* pounds on the belt is developed by an entirely new principle, imbedding the hooks in perfect alignment absolutely flush with the surface, thus prolonging the life of the lacing and reducing the wear on the hooks and pulleys to a minimum. And it will lace even the smallest belt with increased efficiency and economy.

Industrial plant superintendents will immediately appreciate the value of the new Clipper Trojan No. 8 Lacer to their plant operation.

The Clipper Trojan No. 8 Lacer is furnished with or without stand. Weight 100 pounds. For complete demonstration and prices communicate with your nearest Clipper dealer, or with the

Clipper Belt Lacer Company

GRAND RAPIDS **MICHIGAN**

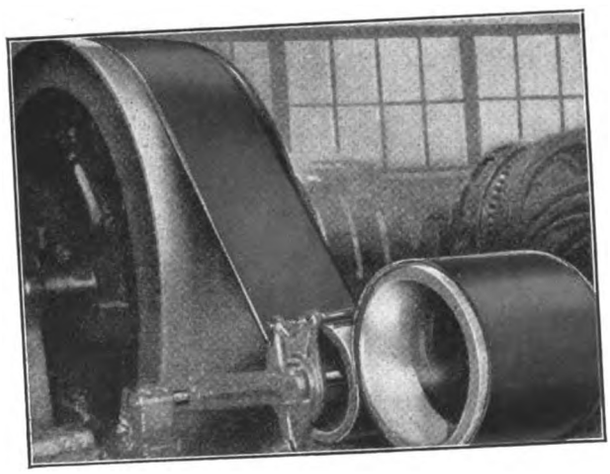
QUALITY Clipper BELT LACING

* These figures were determined by actual tests made in the laboratories of the Worcester Polytechnic Institute by Prof. Francis W. Roys, Head of the Dept. of Mechanical Engineering.

Clipper Trojan Belt Lacer

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SCHIEREN BELTS DO LAST LONGER



The pliability of special tannages is obtainable in Duxbak Belting without having to pay the usual premium

FOR smaller pulleys and higher line shaft speeds you need more pliable belting. It must be more pliable to maintain its length of life under harder conditions.

In Duxbak Belting you get not only pliability but also the long life of the oak tannage.

The scouring process accounts for the pliability of Duxbak Belting and makes it different from all other belts. A Duxbak Belt must last longer and be more pliable just because it is scoured.

Let us send you a copy of L. H. Hopkins' article, "Group Drives More Economical for Most Conditions."

DUXBAK BELTING TRADE MARK

Chas. A. Schieren Company

Tanneries: Bristol, Tenn.

Main Office and Factory
31 Ferry St., New York

Distributing Branches and Dealers in All Leading Cities Throughout the World

DUXBAK WATERPROOF LEATHER BELTING

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DRUGGED

On the Job by Bad Air

It might be a clerk—it might be an important department head—yes, it might even be *you*. In a fog of Bad Air when there are delicate letters to write, or important decisions to make, or accurate work to be done in a rush—what happens?

What grave errors—costly, embarrassing, even tragic—can you trace to brains beclouded and judgment paralyzed by stale, depressing, energy-sapping air? You blamed carelessness for these errors. Perhaps you were right. Yet it is Bad Air that *breeds* carelessness, and Bad Air was directly to blame.

American Blower Electric Ventilation conquers Bad Air. It removes the cause of carelessness by delivering an abundance of invigorating oxygen to every out-of-the-way corner.

It can be installed without disturbing your office arrangement—without interference with your daily routine. It costs no more than adequate lighting fixtures—it adds only a trifle to your equipment inventory.

American Blower ventilating units—the world's standard for 46 years—are available in many sizes and models for homes, stores, offices and factories of every kind. We will gladly supply details of the proper system for *your* requirements. Just phone your electrical contractor or mail the coupon today.

AMERICAN BLOWER CO., DETROIT
Branch Offices in All Principal Cities
Canadian Sirocco Company, Ltd., Windsor, Ont.

Frequency of Air Changes Necessary for Various Applications*

Offices	5 to 10 minutes
Toilets	3 to 5 minutes
Bakeries	3 minutes
Cabins	5 minutes
Tunnels	1 to 10 minutes
Projecting Booths	2 minutes
Laboratories	3 to 10 minutes
Conduits	1 to 10 minutes
Ship Holds	10 minutes
Kitchens (Home)	2 to 3 minutes
Laundries	5 minutes
Theatres	5 to 10 minutes
Assembly Halls	5 to 10 minutes
Garages	5 minutes
Dining Rooms	5 to 15 minutes
Machine Shops	15 minutes
Lodge Rooms	10 minutes
Foundries	5 to 10 minutes
Retail Stores	5 to 15 minutes

*This table based on climatic conditions in Central United States. Other tables for specific localities are available.

C O U P O N

AMERICAN BLOWER CO., DETROIT, MICH.

Send details relative to the application of American Blower Electric Ventilation to

(*Business*) _____

Name _____

Address _____

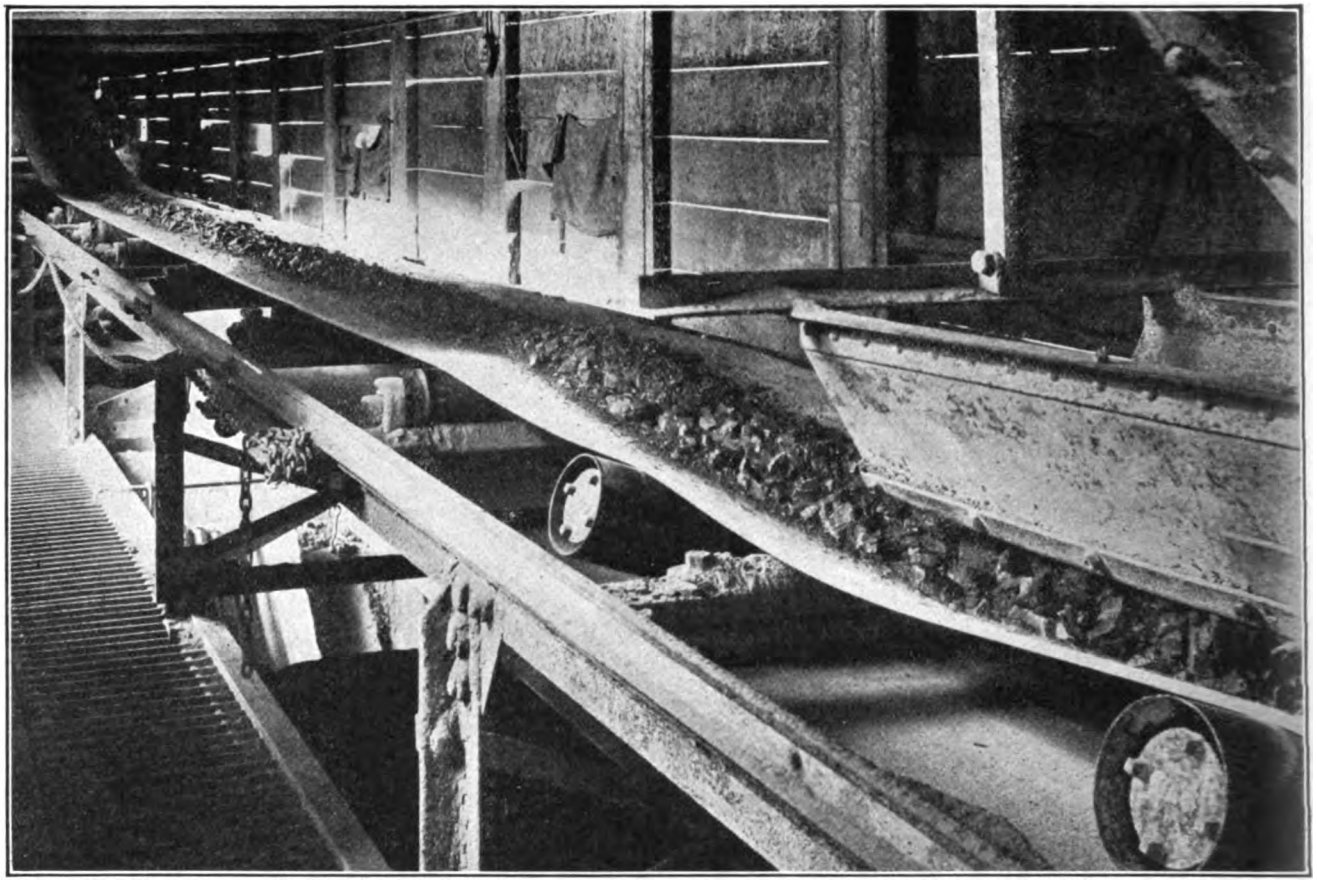
City and State _____

© 1927 A.B. Co. (593)

American Blower
"Sirocco"
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

GOOD VENTILATION IS ONLY GOOD BUSINESS

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Conveying Limestone in South Wales —with "U. S." Belts

All over the world, "U.S." Conveyor Belts are carrying materials of every description —efficiently and economically. From South Wales, England, comes this story of a "U.S." Belt:

Carrying on the average of 125 tons of broken limestone per hour, this "U.S." Belt in the Aberthan and Bristol Channel Cement Works has given satisfactory service—and there is every indication that it will outwear any other belt ever used for the same service in this plant. This belt is 237 ft. long, 27 in. wide and 6x4 ply. It runs at a speed of 250 ft. per minute.

"U.S." Conveyor Belting is built to meet th individual needs of the installation. Our sale engineers, backed by 75 years' experience i the manufacture and installation of Mechan cal Rubber Goods, are ready to serve yo The "U.S." trade mark is your guaranty fro the world's largest rubber organization satisfaction, quality and service.

United States Rubber Compar

1790 Broadway **New York C**

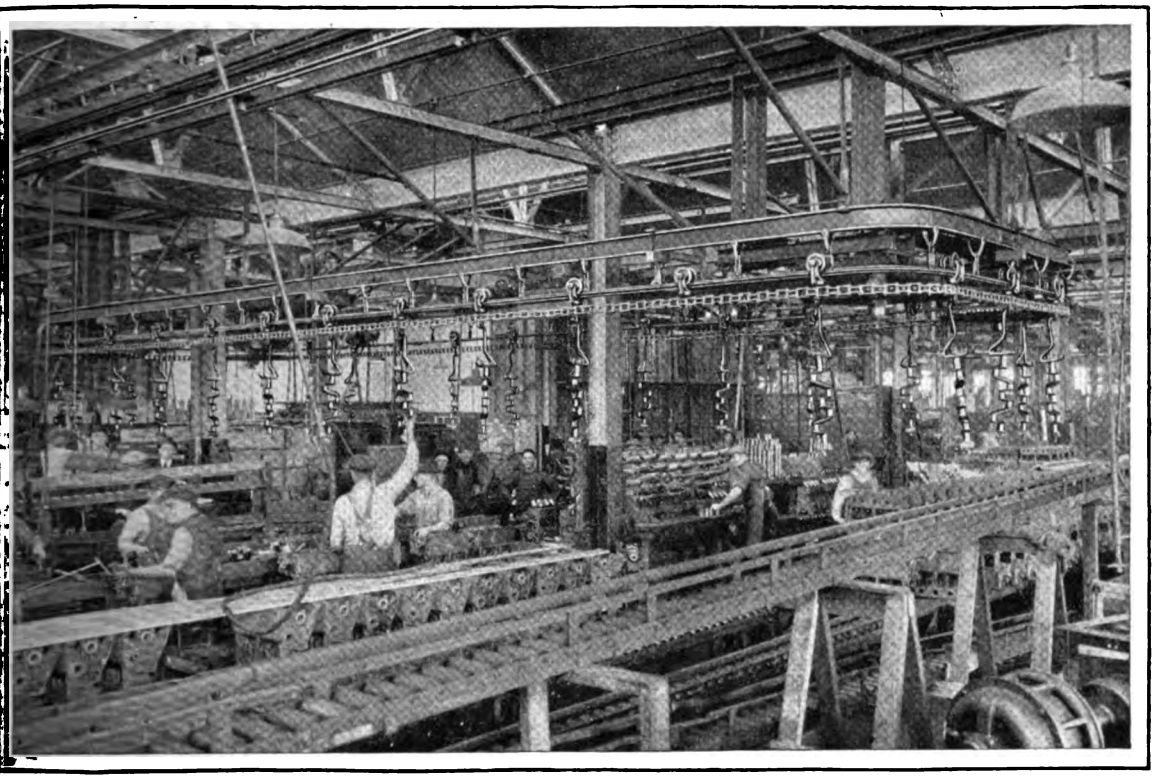
Trade US Mark

Branches in every industrial center

"U.S." Conveyor Belts

FO' VERY INDUSTRIAL NEED

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The Louden Overhead Track and Trolley System pictured above is saving time, energy, and money in one of the large Automotive plants. Here Louden Monorail is used in conjunction with a motor driven chain carrying 200 crank shafts

at this very moment—
put your mind on this "*single track*"!

Is the ceiling in your plant a broad expanse of wasted space? Is your material still being moved laboriously and at great expense by hand? Then you are ignoring one of the greatest sources of economy and profits in your plant. *You need to investigate the wonders of economy accomplished by the Louden Industrial Monorail System of Overhead Lifting and Carrying.*

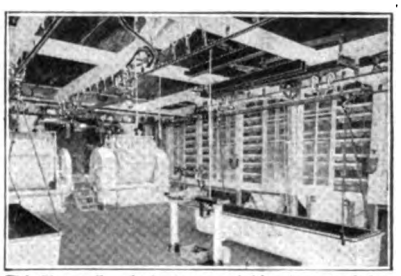
Your ceiling can be made the right of way for a Louden Monorail which will speed up the handling of your product in every stage of its manufacture. It will reduce handling charges, relieve congestion on the floor, prevent accidents, and eliminate the exhausting labor of lifting and hauling. That one rail on the ceiling is worth twenty men on the floor! It binds departments together in a unit and coordinates their work. By increasing productive capacity the expense of new building is postponed or saved.

Get this Book on Material Handling



Just off the press. It tells a remarkable story about the conveying of materials in process of manufacture, handling finished products, etc. 56 pages of dimensioned drawings and 72 pages illustrating application of Louden Monorail to many types of work, including yours, complete information on track, trolleys, switches, dipping machines, cranes, monorail scales, track hoists, etc. Shows how to cut production costs. Write for a copy of this valuable book. No cost or obligation.

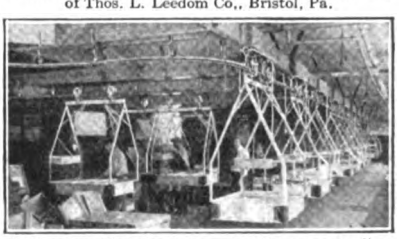
The Louden Monorail System is adaptable to any plant, large or small, to the handling of practically any material or product up to 2000 pounds. Its trouble-proof perfection is the result of years of patient development and the test of actual service in thousands of plants. A variety of uses and a wide flexibility of application make it one of the most definite reducers of overhead costs that can be found for any industry. It will prove successful in your plant. *It will make your ceiling a right of way to greater dividends.*



This Monorail scale for beam weighing is part of the Louden System that holds down costs for the Harris-Boyer Baking Co., Johnstown, Pa. Loaded troughs weigh about 1500 pounds.



Louden Monorail is making big savings in the textile field. Chain drive trolley conveyor system in plant of Thos. L. Leedom Co., Bristol, Pa.



"All orders filled the day received" is a good policy made possible in the plant of the American Products Co., by the installation of a Louden Monorail and the right type of carriers.



Louden Monorail used inside and outside to speed up the handling of concrete blocks for R. E. Hamilton Sons, Detroit, Mich.

The LOUDEN MACHINERY COMPANY
601 West Ave. (*Established 1867*) Fairfield, Iowa

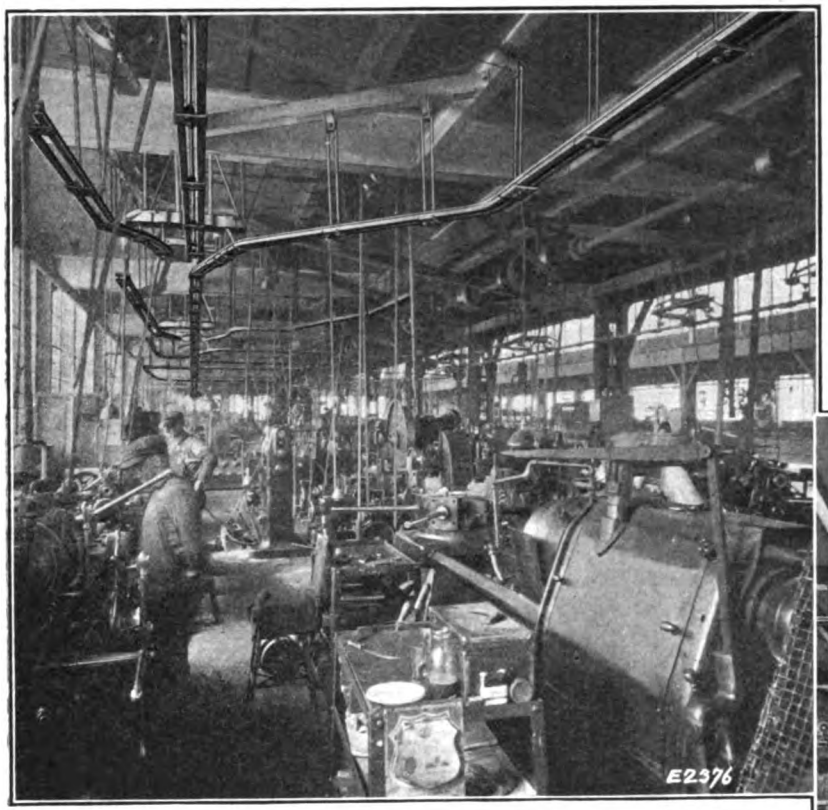
Albany
Boston
New York
Philadelphia
Buffalo
Pittsburgh
Atlanta
Cincinnati

Cleveland
Toledo
Detroit
Chicago
St. Paul
St. Louis
Los Angeles

LOUDEN
INDUSTRIAL MONORAIL SYSTEMS
for Overhead Lifting and Carrying

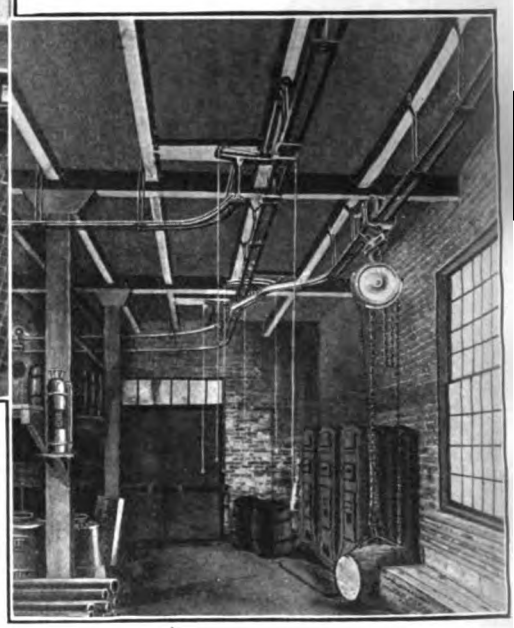
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In the Largest Industrial Plant



or

In the Smallest Shop



The ATLAS DUO-RAIL SYSTEM

Pays Dividends

Many large industrials now use the ATLAS DUO-RAIL System of plant transportation, which employs the railroad principle of two rails instead of one.

But, smaller plants and departments of large plants, where a minimum of handling is required, can use the ATLAS. Even in the smaller plants, the ATLAS pays dividends.

The ATLAS DUO-RAIL carries the load on wheels on the ball of two rails. The rails are staggered exactly as in railroad track. With the ATLAS, there are no sudden strains, no jars or vibrations. The load moves along silently and smoothly. For this reason glass, wet enamel ware, pottery, cement forms and molten metal or foundry flasks are handled with absolute freedom from vibrations and with perfect safety.

Get all the facts about the ATLAS DUO-RAIL System. It is really a step ahead in overhead transportation.

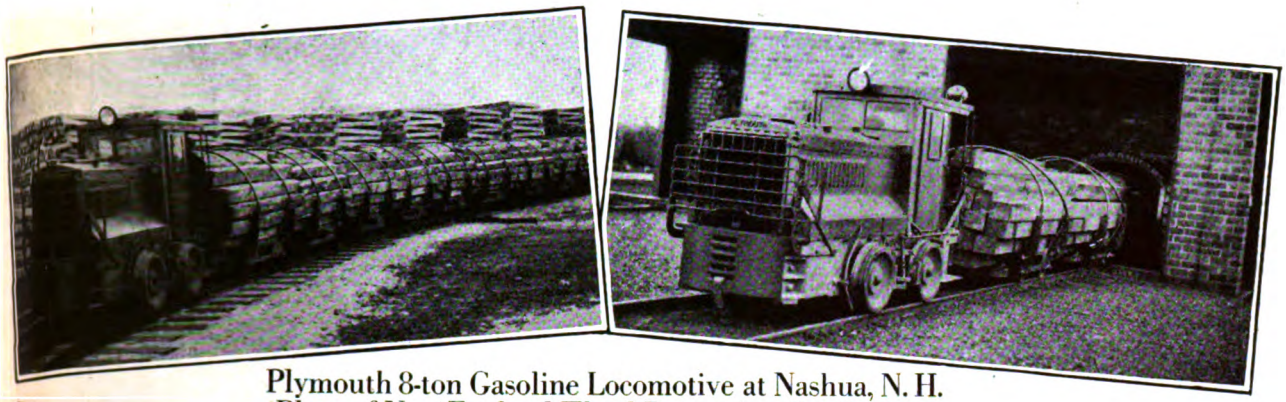


Write for a copy of "The ATLAS of Mechanical Conveying." It is free.

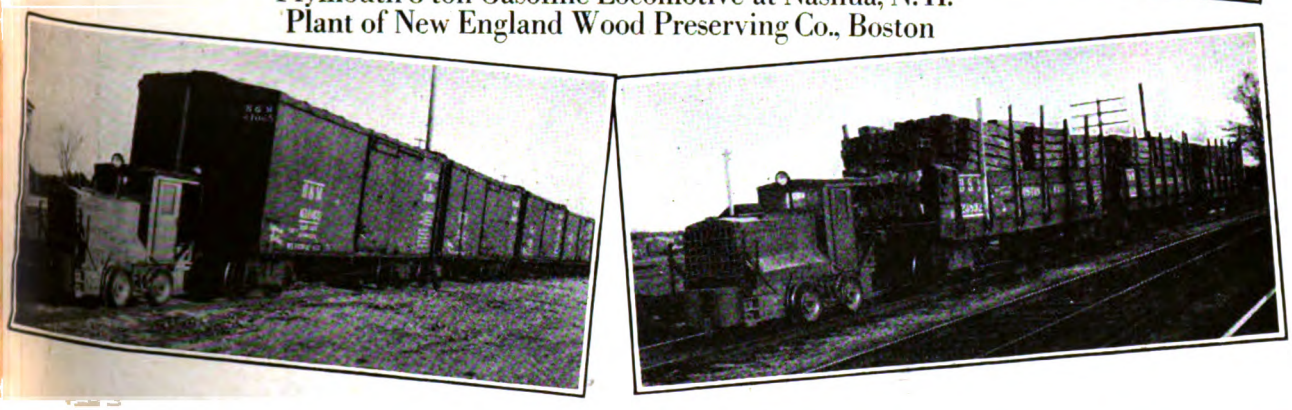
The ATLAS-CHICAGO COMPANY
Division of Chicago Electric Company
740-744 West Van Buren Street, Chicago, Illinois



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Plymouth 8-ton Gasoline Locomotive at Nashua, N. H.
Plant of New England Wood Preserving Co., Boston



Plymouth Cuts Haulage Cost

THIS is a gasoline motor age. In no field of engineering has there been such rapid strides as in the development of the gasoline motor. Always ready, no coal to haul, no "firing up," no boiler troubles, no "stand-by" expense—the gasoline motor is rapidly displacing antiquated haulage methods.

The Plymouth Gasoline Locomotive is the pioneer in industrial haulage. It is the pace-maker with more speed, more power and more years of service.

Made in 3 to 25 ton sizes, and in any track gauge, to meet every requirement. No matter what the enterprise or industry, if haulage is a problem, then the Plymouth is the solution.

Write for Catalog and Performance Bulletins.

New England Wood Preserving Co.
Boston, Mass.

The Fate-Root-Heath Co.,
Plymouth Ohio.
Gentlemen:

Our Plymouth 8-ton Gasoline Locomotive has given very satisfactory service.

Most of the time it is used for hauling trams of ties and timbers about our yard and into and out of our treating cylinders. Although they do not all show in the photo there were twelve tram cars in this train and the total weight, loaded, was about 133,000 lbs.

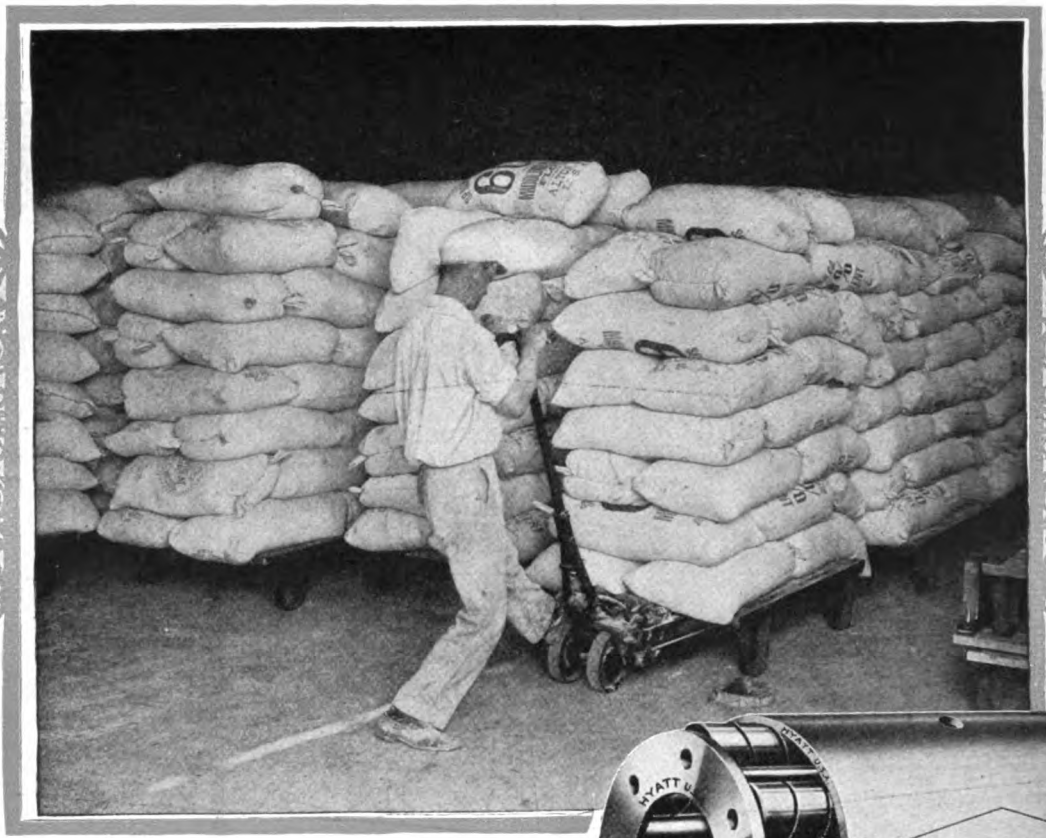
Heretofore this hauling was done by a large steam locomotive which is now used for handling standard railroad cars.

On several occasions, when our large steam locomotive has been laid up for repairs, we have done all of our switching with the Plymouth, hauling as high as five box cars, each loaded with 30 hardwood ties making a total gross load of approximately 525,000 lbs.

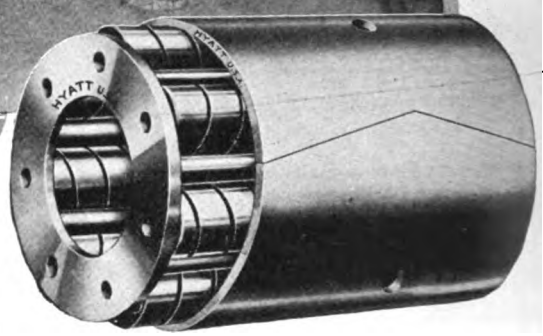
Very truly yours,
NEW ENGLAND WOOD PRESERVING COMPANY
(Signed) E. S. Park.

PLYMOUTH
Gasoline Locomotives

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Handling 30 sacks of flour at one time with a Hyattized Barrett Lift Truck, made by Barrett Cravens Company, Chicago, Ill.



Steady Performers

—*in these Barrett Lift Trucks*

BOTH trucks and bearings have built enviable reputations for long life and steady, money-saving service.

Proved design, careful material selection, and skilled workmanship at the Hyatt plant protects against bearing delays, breakdowns and irregular performance.

Hyatt Roller Bearings experience practically no friction or wear and require very little attention—assuring ten or twenty years of carefree operation.

In winning and holding Barrett Cravens confidence, Hyatt again has justified the importance of building truck performance and profits from the bearing points.

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO PITTSBURGH WORCESTER
PHILADELPHIA OAKLAND CLEVELAND

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

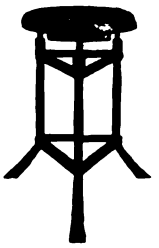
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EVER-HOLD MARK

AUTOMATIC ADJUSTABLE

Steel Stools for Office, Shop and General Factory Work

Patented March 16, 1926



STEEL CONSTRUCTED

Adjustable to any desired height in a moment's time without any tools. Beautiful hardwood seats.

The patented automatic adjustment is a radical departure from the old fashioned screw type or angle iron stool. It is instantaneous.



A complete line of Stools and Chairs to suit any requirement. Built for

SERVICE
COMFORT
BEAUTY
ECONOMY

ASK FOR OUR LATEST CATALOG

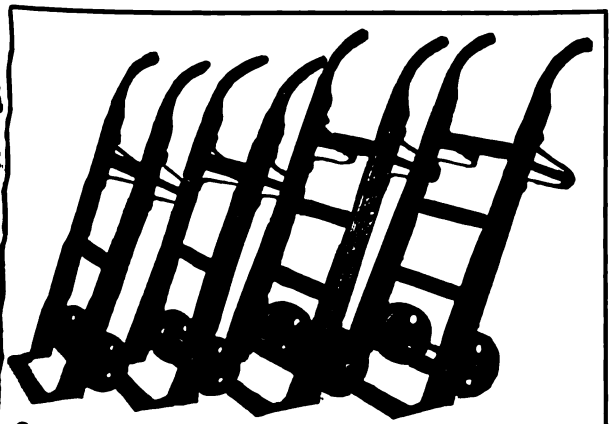


Eastern Distributors:
INDUSTRIAL SALES CO.
328 Main St., E. Rochester, N. Y.

Western Distributors:
ADOLF RRESE CORPORATION
726 So. Hope St., Los Angeles, Calif.

Other Distributors Wanted

VITEK MFG. CO., Omaha, Neb., U. S. A.



Complete Stocks Everywhere

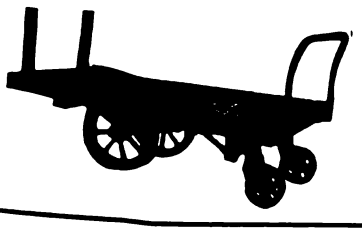
No matter where you are located, there is a mill supply dealer within a few miles who can deliver from stock any one of 26 different models.

Just keep in mind in ordering factory trucks that *the best will always be made of wood—steel-bound*, and that "best" can be delivered at your door the same day you telephone.

Order by number from our truck catalog.

THE FAIRBANKS COMPANY
Broome and Lafayette Sts., New York, N. Y.

Fairbanks





The Marvel of Sawdom

ONAN "SAFTY SAW" will cut crating costs **50%** and sawing costs **90%**. Think of the profit this will make in your shipping department, and what it means to eliminate hand sawing! Think of the crating lumber that can be salvaged quickly and economically!

Of all the machines ever devised to speed up work in the shipping room or to save lumber, none have ever cut costs like **ONAN "SAFTY SAW".**

With this MARVEL OF SAWDOM, one man can do the work of ten men sawing by hand. He can cut lumber for crates, build bins, resize boxes, reclaim scrap lumber—all at a saving as high as 90%. Cross cuts, rips, miters—any sawing job, carpenter work, maintenance, repairs.

ONAN "SAFTY SAW" is PORTABLE, can be moved anywhere on wheels provided (not casters). Runs from the lighting socket. Easy to handle.

Shippers everywhere, large or small, are using and praising the **"SAFTY SAW".** Why not try one at **OUR expense.** Tear at the black line, sign and we will **mail** details and our free trial suggestion. No obligation or expense on your part, nor will a salesman bother you.

D. W. ONAN & SONS
203 Royalston Ave., Minneapolis, Minn.

D. W. ONAN & SONS, 203 Royalston Ave., Minneapolis, Minn.

As per your advertisement, we would be interested in further details on **ONAN "SAFTY SAW".**

We have direct current..... Alternating current .....

Name.....

Company.....

Street.....

City..... State.....

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ECLIPSE BRITEN-ALL

An Economical, Lasting, White Finish

Most factories, mills and warehouses desire a white finished wall, but in most cases a white finish will not last any great length of time without being washed or repainted.

ECLIPSE "Briten-All" gives a finish as white as the most expensive wall paint, **yet it costs much less.** It is easy to apply, requires only one coat and adheres firmly to the surface for a long time.

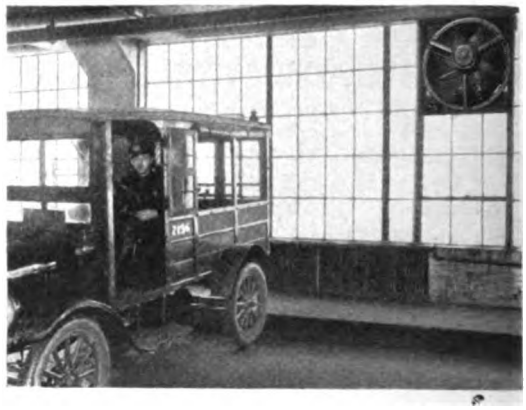
ECLIPSE "Briten-All" is intended for all classes of interior work where light reflecting and brightening-up standards are paramount. In fact, some concerns find it more efficient, from a light diffusing standpoint, to finish their walls with ECLIPSE "Briten-All" every one or two years instead of washing them—and more economical, too.

You receive one-hundred cents worth of wear for every dollar you spend for "Briten-All" and your walls will be whiter and cleaner.

Detailed information with sample panel gladly sent on request.

The Eclipse Paint & Mfg. Co.
Cleveland, Ohio, U.S.A.

Dallas
Philadelphia
Denver
San Francisco
Newark
Charlotte, N. C.



Diehl Exhaust Fans in Garage of Phila., Pa., Post Office

The garage of the United States Post Office, Philadelphia, Pa., takes care of some 70 automobile trucks which are used to collect mail matter throughout the city. The chauffeurs and mechanics are protected by a battery of Diehl exhaust fans, from the deadly carbon monoxide fumes.

Every garage should be equipped with Diehl exhaust fans.

Send for descriptive bulletin—now.

DIEHL MANUFACTURING CO.
ELIZABETH, N. J.
ATLANTA BOSTON CHICAGO NEW YORK PHILADELPHIA

DIEHL

ESTABLISHED 1888

In what condition is your copy of

Emerson's

"Twelve Principles of Efficiency?"

Worn out from constant use? Borrowed by somebody, and never returned? Or have you just put off the privilege of owning a copy at all?

In either case use this coupon. You should by all means have a copy handy for reference. The oftener you dip into it, the stronger will be your grip on the fundamentals of Good Management, which lie at the basis of all business success, all economical production, all lowering of costs, all boosting of profits, all satisfactory human relations.

It is the great Management Classic which has helped thousands of men to improve their knack of directing men, machines and methods to the most enduring economical advantage. It will be sent to you for your FREE EXAMINATION.

423 pages; bound in red cloth; $3, postpaid

Mail this TODAY

The Engineering Magazine Co., I-II-3
381 Fourth Ave., New York City

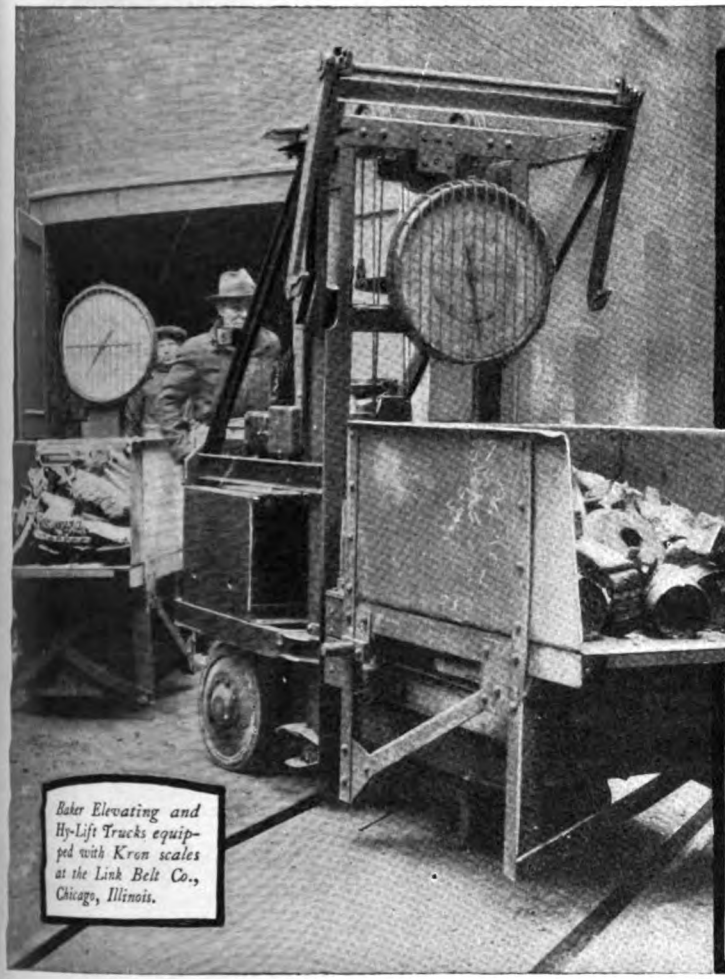
Send me on ten days' approval one copy of Emerson's "Twelve Principles of Efficiency." If I keep it, I shall remit $3.

Name .....

Street .....

City ..... State .....

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Baker Elevating and Hy-Lift Trucks equipped with Kron scales at the Link Belt Co., Chicago, Illinois.

Built for the Job

DRIVING flexibility and ease of operation both fit Baker industrial tractors, trucks and cranes for use in crowded aisles and congested spaces.

Their speed, power and rugged construction assure easier, faster, more economical movement of heavy, bulky materials.

THE BAKER-RAULANG COMPANY
West 25th Street Cleveland, Ohio

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.

Baker



"The SAMSON of BALERS"

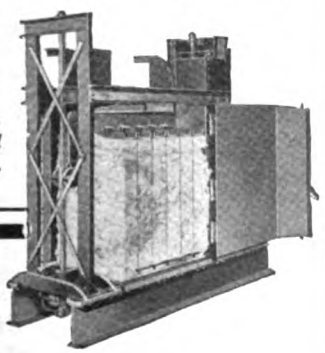
Power — Speed — Efficiency — Durability. These features distinguish the SCHICK Baler wherever it performs. All baling operations are simplified by its use. In compression force particularly—as applied to paper, excelsior, rags, wood and metal scrap—the SCHICK Baler excels. It is a veritable Samson of power.

Schick Balers are all-steel and made in 8 sizes: Hand balers, 125 to 375 lbs. capacity; Power balers, 350 to 1500 lbs. capacity. Depend on a SCHICK for every baling need.

DAVENPORT MFG. COMPANY
Dept. R,
Davenport, Iowa

ALL-STEEL Schick FIREPROOF

Write Dept. R for interesting catalog and prices. No obligation.



Get Belt-Wrap and Save Power, Bearings, Belts

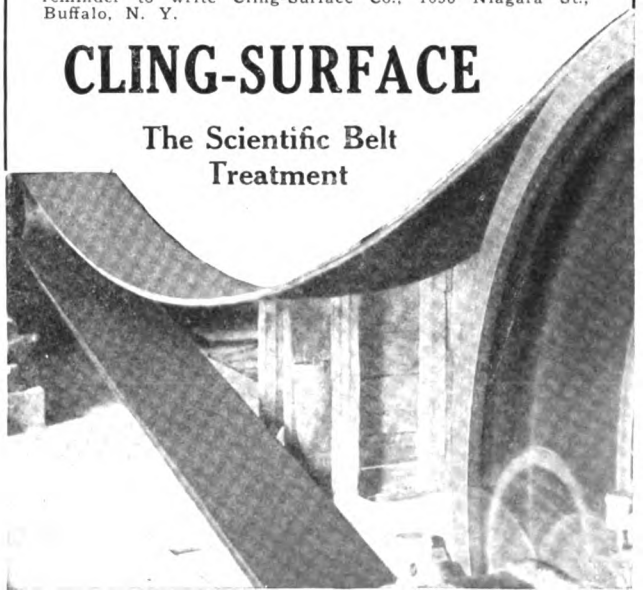
Give your belts greater pulley contact—more slack. Cling-Surface them to prevent slipping—to stop power losses and bearing troubles. You will also multiply belt life several times over.

Over 30 years of nation-wide use has proved the effectiveness and economy of Cling-Surface as a belt and power saver. We can refer you to many enthusiastic users in your own vicinity.

If this is not enough, you may test this scientific belt treatment 60 days, proving its real value before you pay. Order 3 or 6 gallons *on trial*. Advise whether or not your plant conditions are warm, dry, clean. Clip this ad as a reminder to write Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

CLING-SURFACE

The Scientific Belt Treatment



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BEARINGS. Transmission and Line Shaft

Engineering Data on Anti-friction Bearings that permit higher speed at the lowest friction loss. See page 33. The New Departure Mfg. Co.

An Oilless Bearing is described on page 55 by the Arguto Oilless Bearing Co.

Spherical Bearings for the Brute Jobs of Industry. S. K. F. Industries. See pages 58-59.

Bearings that make heavy lifting lighter. Hyatt Roller Bearing Company. See Colored Advertising Section.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

A New Motor Totally Enclosed—Self-ventilating is described on page 51, by Howell Electric Motors Company.

Descriptive Bulletin explains the complete line of motors from one-quarter to forty H.P. single and polyphase Manufactured by the Valley Elec. Co. Page 115.

For pushbutton control of electric motors without extra cost see page 52. The Triumph Electric Co.

Complete Details can be obtained on a Motor that gives long service. See page 82. Master Electric Company.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 65.

Information on a Drop Cord System that saves its cost many times in lamp renewals. See page 121. Appleton Electric Co.

Bulletin Describing the Advantages of Exhaust Fans, is offered by Diehl Manufacturing Company. See page 108.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 118.

Electrical Starters and Control Apparatus that protects man, motor and machine. See page 41. The Cutler-Hammer Mfg. Co.

The Reserve Power Single Phase Motor is described by The General Electric Company on J-K. See Colored Advertising Section.

50 Different Motors for 50 Special Jobs is partly illustrated. D. (See Colored Advertising Section). The Domestic Electric Company.

A Copy of The Motor Book contains interesting information on modern construction of motors. See F. (See Colored Advertising Section.) The Lincoln Electric Company.

The U-Re-Lite Hand Book is a 96-page treatise on electrical control. For a copy see L. (Colored Advertising Section). The Cutter Company.

The Conquest of Bad Air is described on S. (See Colored Advertising Section) by American Blower Co.

Increased Production by Improved Lighting is described on page 111, by Industrial Lighting Committee.

Catalog No. 100 is a 32-page book on air moving. See page 113. New York Blower Company.

MAINTENANCE

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 57. The Vortex Manufacturing Co.

Fans Which Supply More Air with less power are described on page 62 by Robinson Ventilating Co.

A Steam Trap with a snap action is offered for sixty-day trial by The Illinois Engineering Company. Page 44.

A Spray that will save from 60 to 80% is described by Binks Spray Equipment Company. See page 60.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 69.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 40. The Nitrose Company.

Horton Tanks for Fire Protection is the name of the booklet offered by Chicago Bridge & Iron Works. See E. (See Colored Advertising Section).

A Safety Ladder That Can't Slip, Slide, Wobble, Sway or Collapse is described on page 36. The Dayton Safety Ladder Co.

An Asphalt Paint that is waterproof, weatherproof, acid and alkali resisting. American Asphalt Paint Co. See page 75.

"More Light" is the name of a booklet describing the possibilities of large savings in interior painting. U. S. Gutta Percha Paint Co. See page 3.

Information on Scientifically prepared protective Coating for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co. See page 116.

The Solution of Space Problems is described in a catalog of The Maryland Metal Building Company. See A. (See Colored Advertising Section).

A New Broom is announced by The Osborn Mfg. Co. See (See Colored Advertising Section).

Window Walls that Aid Production. See H. (See Colored Advertising Section). Detroit Steel Products Company

A Quick Method of Painting Walls is shown. See 108. The Eclipse Paint & Mfg. Co.

MATERIALS HANDLING

Hand Trucks that are noted for exceptional strength and flexibility. See page 107. [illegible] Co.

"The Hoist Book" shows [illegible] ater economies. Shepard Electric Crane [illegible] Back Cover.

A Complete Line of Overhead Material Handling Equipment See page 73. Chisholm-Moore Mfg. Co.

"The Atlas of Mechanical Handling" is a book containing

(*Continued on page* 112)

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Improved Lighting Increased This Factory's Production 10 Per Cent

"WE have noticed quite an improvement in our production output since the new lighting installation averaging fully 10 to 12 per cent, and we feel that the improved lighting has paid for itself in the short space of time since we have made the change"—Stricker-Beitman Company, Cincinnati, Ohio, manufacturer of trousers and overcoats.

The same satisfaction was experienced by over 15,000 factories which brought their lighting up to standard last year.



This company is just one of the 689 factories in Cincinnati which changed their lighting on the recommendation of the Cincinnati Electric Club. The accompanying photos show that lighting thought adequate was greatly improved.

Industrial Lighting Fact No. 5

You, too, can increase your production by bringing your lighting up to the proper standard. Without cost your local electric light company will show you how.

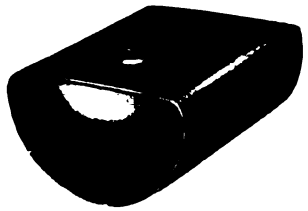
Industrial Lighting Committee, National Electric Light Association
29 West 39th St., New York

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Cut Your Handling Costs

Many plants find themselves in the doubtful position of trying to vie with competition by producing their

SHEET METAL PARTS



with equipment totally inadequate to fabricate these parts at a cost sufficiently low to be able to successfully compete with their rivals.

To those who find themselves in this position we offer an opportunity to correct this condition.

Our engineers will help you with any particular job that is now giving you trouble, all that we require is a blue print or pencil sketch.

Iron castings in many instances can be replaced by sheet metal parts, thereby cutting out completely your machining costs.

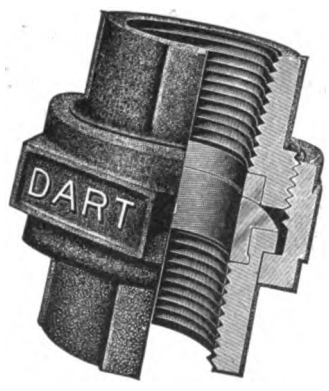
Try sheet metal parts on your next Job.

STEEL, IRON, BRASS, COPPER, MONEL METAL
STAMPING—FORMING—DRAWING
BLANKING—PUNCHING

The Breese Bros. Co.

CINCINNATI, OHIO

See data A.S.M.E. Condensed Catalogue of Mechanical Equipment. MacRae-Hendricks, Sweets Engineering and Thomas Catalogues.



Are You INSURED against Power Wastes ?

DART Unions make possible the utilization of every ounce of steam.

The two bronze seats insure a sealed joint which eliminates any possible waste.

The threads long, clean and sharp make fitting easy.

The DART guarantee—"Two for one if found defective" insures your power.

Let the DART Union be your policy.

E. M. DART MFG. CO.

Providence, R. I.

Sales Agents — **The Fairbanks Company New York and branches**

Canadian Factory — **Dart Union Co., Ltd. Toronto, Canada**

WHERE to PURCHASE MODERN EQUIPMENT
for Mill Shop & Factory

(*Continued from page* 110)

information on overhead carrying systems which applies to the railroad principle of two rails. The Atlas-Chicago Co. See V. (See Colored Advertising Section).

The Economies in The Handling of Bulk Granular and Dusty Materials is described on O. (See Colored Advertising Section). Dust Recovering & Conveying Co.

Conveyor Belts for Every Industrial Need. See T. (See Colored Advertising Section). United States Rubber Company.

A New Book Showing How to Cut Production Costs may be had from the Louden Machinery Company. See U. (See Colored Advertising Section).

The Gasoline Motor That Cuts the Haulage Cost. See W. (See Colored Advertising Section). The Fate-Root-Heath Company.

A New Track Unloader that fits right on to the coal car is described on page 118 by the Chicago Automatic Conveyor Company.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 115.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 178. Canton Foundry and Machine Co.

"Snapshots of Sensible Savings" is the name of a booklet describing the Tier Lift Truck in Operation. Lakewood Engineering Co. See page 113.

An Automatic Weighing and Sacking Scale that weighs and fills five sacks per minute. See page 71. Richardson Scale Company.

A Ball-Bearing I-Beam Trolley with capacities of ¼ to 4 tons is offered for free trial, by Richards-Wilcox Mfg. Co. See page 25.

Bulletin Describing a Tractor that will operate in narrow aisles and congested places is described on page 61, by Yale & Towne Mfg. Co.

Casters That Speed Up Production are described on page 45, by Bond Foundry and Machine Company.

Trailers and Hand Trucks for Every Purpose. Lansing Company. See page 82.

Bulletin-104-F—Describing Harvard Steel Ball-bearing truck casters is offered by Bassick Company. See page 37.

Factory Certified Wire Rope for materials handling purposes See P and 117. (See Colored Advertising Section). Williamsport Wire Rope Company.

A Handy Tool for Moving the Heaviest of Railroad Cars For information see page 115. The Advance Car Mover Company.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzgar Company, Inc. See page 78. Booklet offered.

"Seven Economies of Logan Conveyors" is a book on handling at lower costs. See page 1. Logan Company.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 82.

A Light Weight Substantial and Highly Efficient Electric Hoist that can be used anywhere that a chain block is used. See page 119. Roeper Crane & Hoist Wks., Inc.

A Spiral Conveyor is described by Jeffrey Manufacturing Co. on page 35.

Bucket Conveyors for Every Service. See page 122. Link-Belt Company.

A Lift Truck with Knuckled Steering Wheels. C. A. Graham See page 68.

A Lift Truck Equipped With Scales is described on page 10 The Baker-Raulang Co.

Portable Loaders. Catalogs can be obtained from Portable Machinery Co. See page 53.

A Crane for Every Service is described on B. (See Colored Advertising Section), by The Whiting Corporation.

Trucks With The Famous Service Casters are described on (See Colored Advertising Section). Service Caster Truck Company.

(*Continued on page* 114)

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We Originate and Build.

Strand

Twenty-Two Years in This Industry

ESTABLISHED 1905

Flexible Shaft Equipments

Are known the world over for their Strength and Durability

Type M 7-1 H.P.



We Build Many Types and Sizes

Originators of the Three Speed Motor Counter Shaft

Capacities from 1/10 to 2 H.P.

Send for Catalog

Manufactured by

N. A. STRAND & CO.

5001 No. Lincoln St. Chicago



TYPE ME FAN

Quiet Operation

A quietness and smoothness heretofore unknown—is one of the outstanding achievements of the Type ME Fan. Lower RPM and tip speed for a given pressure, higher total and static efficiency, greater economy, durability of apparatus and precision workmanship—all are *guaranteed.*

ME Fan Ratings and Capacities have been definitely established and certified, making it unnecessary to use a motor larger than shown in capacity tables.

Write today for catalog 100 that gives complete data.

Fans
Unit Heaters
Air Washers
Blowers
Furnaces

NEW YORK BLOWER COMPANY

General Offices
2244
So. Halsted
Chicago











Some-where

Somewhere in your plant there is a handling operation that is now taking the time and labor of several men. It may be in your shipping room. Perhaps it's in the transporting of heavy dies or castings from one point to another. Or it may be in the storing of raw stock or finished products.

There are hundreds of such handling and transporting problems in every industrial plant, and the plants which handle these jobs most economically are the plants which use Electrical Tier Lift Trucks at a saving of from 3 to 7 men for each Lakewood Tier Lift Truck in operation.

We now have ready for distribution an illustrated booklet which clearly describes ways and means of reducing production costs. A copy will be sent to you on request. Just ask for "Snap Shots of Sensible Savings."

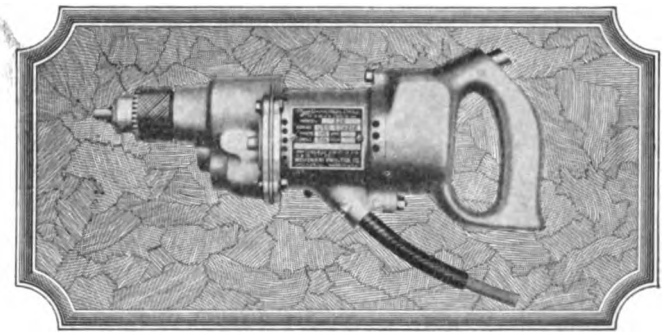
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LAKEWOOD ENGINEERING CO.

CLEVELAND OHIO

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Thor ELECTRIC DRILLS



Power—Lots of It

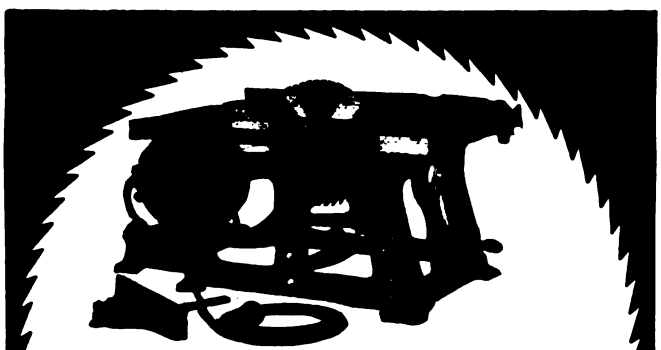
There's more power in a THOR than you'll probably ever use. But it's there for emergency. That's because from its spindel end to its grip handle, the THOR is built of rugged, easy-running parts, and has a super-power, non-stallable motor. It is built the way you have always hoped an electric drill would be built. And it's safe—shocks are impossible because a 3 wire safety cable is standard equipment. Our catalog should be in your files—let us send you a copy.

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS — GENERAL OFFICES 600 W. Jackson Blvd. CHICAGO — ELECTRIC TOOLS

FACTORY AURORA, ILL. — BRANCHES THE WORLD OVER

Eastern Office 1463 Broadway, New York. *London Office 40 Broadway, Westminster, London*



To Cut Costs—to Do Fine Work, Use This Saw

FOR absolutely accurate work on the finest cabinet and pattern jobs in either hard or soft wood, the H & A Portable Electric Bench Rip Saw is ideal for large and small manufacturers.

While doing excellent work, this machine reduces production costs because it saves time and labor, being moved quickly wherever needed in the busy plant. The No. 8 H & A Rip Saw is a guaranteed machine, built with the best materials and workmanship.

All the H & A line of portable electric woodworking machinery, consisting of the rip saw, band saw, swing saw, jointer and lathe, are self-contained units, taking up small floor space and can be moved to any part of the shop on a moment's notice.

Write for further details about these machines which are sold through dealers.

HESTON & ANDERSON

613 W. Depot Ave. — Fairfield, Iowa

WHERE to PURCHASE MODERN EQUIPMENT for Mill Shop & Factory

(*Continued from page* 112)

POWER PLANT EQUIPMENT AND AUXILIARIES

Bulletin 37, Describing Jennings Heating Pumps, is offered by Nash Engineering Co. See page 6.

Temperature Recording, Measurements and control through Tycos Instruments are described by Taylor Instrument Companies. See page 67.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 112.

Catalog Describing a Boiler Feed Water Regulator can be obtained from the Chaplin-Fulton Mfg. Co. See page 80.

Booklet R-64 Describes a temperature regulator. See page 72, Sarco Company, Inc.

Catalog No. 9 on the Industrial Thermometer of The Moto Meter Company, Inc. See M. (See Colored Advertising Section).

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

A Specially Heat-treated Chrome-vanadium Steel Wrench is described on page 62, by Armstrong Bros. Tool Co.

An Automatic Service Grinder for a wide variety of small tools is described by La Salle Tool Company. See page 46.

A Saw for the Shipping Room at a lower price. See page 46. The Parks Ball Bearing Machine Co.

Quick Operating and Wide Opening Lever Vises are described by Edw. Purvis & Son. See page 40.

A New Catalog showing complete line of bench wood-working machines. See page 114. Heston & Anderson.

Catalog Describing A Portable Electric Threader and Cutter is offered by The Oster Mfg. Co. See page 39.

Trimo Tools which "stand the gaff" are described by Trimont Mfg. Company. See page 38.

A Free Trial Offer of safety saws can be obtained by D. W. Onan & Sons. See page 107.

Catalog Describing Bristol Set Screws, cap screws and accessories is offered by The Bristol Co. See page 119.

Sample Blades are Offered by Victor Saw Works. See page 79.

Reversible Ratchet Wrenches are described by Lowell Wrench Company. Page 52.

Catalog Describing Thor Electric Drills is offered by Independent Pneumatic Tool Co. Page 114.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 6

Catalog 57B describes a Vise with seven distinct and exclusive features of construction. See page 70. The Charles Parker Company.

Saws That Cut Even and Clean are described on page 74 American Saw & Mfg. Co.

A Buying Guide for Quality Equipment is to be had in the Brown & Sharpe Mfg. Company, Catalog No. 76. See page 44.

An Interesting File Catalog and Price List can be obtained from the Simonds Saw and Steel Co. See page 34.

Set Screws that are 30% stronger. The Allen Mfg. Co. See page 42.

Porter's Bolt Clippers are described on page 54, H. K. Porter Inc.

High Speed Drills for high speed production. See page 8 The Cleveland Twist Drill Co.

(*Continued on page* 116)

Not advertised in this issue write Industry Illustrated

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lost motion cut to a minimum

— only two movable joints



As the movable joints of a car mover wear, speed and power are taken up by play.

The car mover which has the fewest possible number of movable joints—only two—gives the most efficient service over the longest period of wear. Such is the New Badger.

It shifts loaded or unloaded cars quickly and easily with a saving of both time and money.

There's a satisfaction in the New Badger that can be proved only by use; an investment proved only by time.

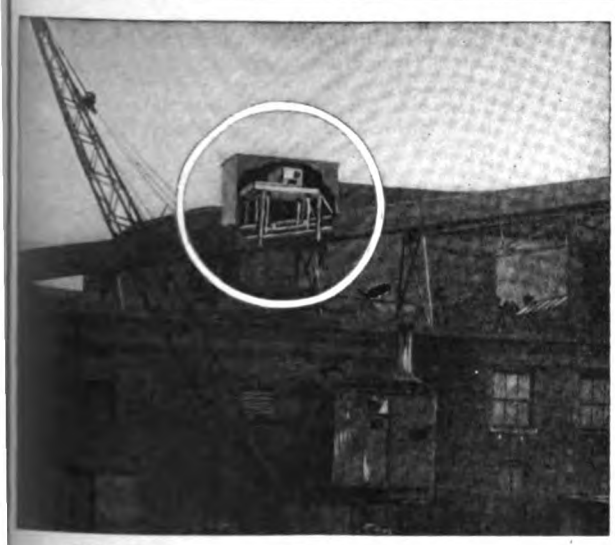
Write for Information

THE ADVANCE CAR MOVER CO.

APPLETON, WISCONSIN

New Badger

SLIP PROOF CAR MOVERS



Weigh as You Convey and Eliminate Losses

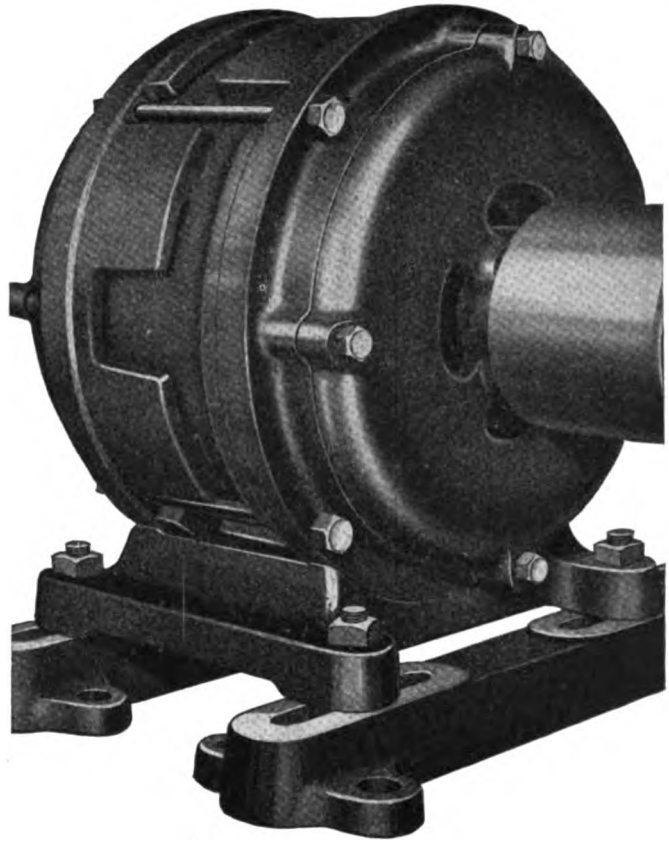
What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.



It pays one dividend of 85%

A LONG series of service tests have shown that the ball bearings used in Valley Motors make possible a lubrication saving of 85%.

For every gallon of oil used by a babbitt bearing motor less than a pint is required for an identical installation of a Valley Ball Bearing Motor.

This is one more reason why we can say that Valley Motors cost less to operate and do more.

Polyphase ¼ to 40 h. p., and Single Phase ¼ to 3 h. p. Write for descriptive bulletin.

VALLEY ELECTRIC CO., ST. LOUIS, MO.

District Offices: Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco

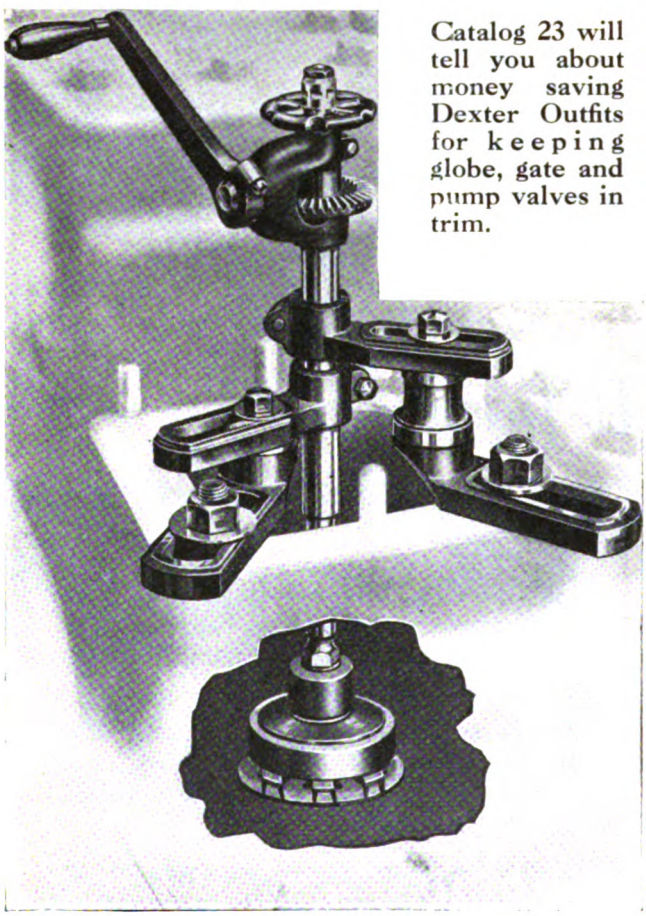
Valley

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The

Dexter Pump Valve Reseating Machine

puts new pep in plodding pumps quickly, easily and economically by making worn, scored valve seats fluid tight and keeping them that way.



Catalog 23 will tell you about money saving Dexter Outfits for keeping globe, gate and pump valves in trim.

THE LEAVITT MACHINECOMPANY

28 East River Street, Orange, Mass., U. S. A.

Canadian Agency: **Darling Bros., Ltd., 120 Prince Street, Montreal.**

British Agency: **Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne.**

Valve Reseating Dexter Machines

528

WHERE to PURCHASE MODERN EQUIPMENT *for Mill Shop & Factory*

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TOOLS, etc.

The Engineer's Wrench, Set No. 25, is described by Bonn Forge & Tool Works on Inside Front Cover.

A Wrench That Can Be Used on pipe and fittings is describ by J. H. Williams Co. See page G. (See Colored A vertising Section).

High Speed Ground Thread Taps are described on pages and 50. Greenfield Tap and Die Corporation.

Bulletin 317-B describes a bending roll machine. See page Buffalo Forge Company.

High Speed Drills with forty-five years' experience behi them. See page 71. The Standard Tool Company.

Literature on Flexible Shaft Equipment, unexcelled for Ha To-Get-At places, is offered by R. G. Haskins Co. page 70.

TRANSMISSION EQUIPMENT Including Belting

A Booklet Describing The Tentacular Transmission Bel offered by Alexander Brothers, Inc. See page 63.

"How, When and Where to Use Burmaline Belting" can obtained from The Burrell Belting Co. Page 2.

A 60-Day Trial on a Belt Preservative. See page 109. Cl Surface Company.

Literature describing the new Conway Disc Clutch is offe by The Conway Clutch Co. See page 66.

Catalog Describing Variable Speed Transmissions is offe by Lewellen Mfg. Co. Page 26.

A Catalog on Flexible Shafting for tool room, machine s pattern shop and foundry. See page 113. N. A. St & Co.

Twin Disc Clutches that prolong the life and increase working capacity of any machine are described by T Disc Clutch Company on page 47.

Bulletin on Timken-equipped Line and catalog No. 43 scribing Transmitting equipment are offered by The dart Company. See page 56.

Literature that Explains the Advantages of Pulleys Pressed Steel Hangers is offered by the American P Co. See page 64.

General Catalog No. 30 gives complete information o Jones Industrial Gears. W. A. Jones Foundry & chine Company. See page 4.

Catalog G. 66, the authority on speed flexibility is offer Reeves Pulley Co. (See N (See Colored Advertising tion).

A New Belt Lacer is described by The Clipper Belt Company on Q. (See Colored Advertising Section).

A Copy of L. H. Hopkins' article "Group Drives More omical for Most Conditions," is offered by Cha Schieren Company. R. (See Colored Advertising tion).

MISCELLANEOUS

Twelve Thin Lead Colored Pencils are described by A can Lead Pencil Co. See page 119.

Fabricated Sheet Metal Parts. An engineering service by The Breese Bros. Co. See page 112.

An Economical Means of Cleaning Parts and Pro Page 80. Oakite Products, Inc.

A Booklet Describing Counters for rate setting and p tion work. See page 63 The Veeder Mfg. Co.

Illustrated Folders on the Hallowell Pressed Steel Legs and Workbenches should interest every ind executive. See page 77. Standard Pressed Steel pany.

Eye Protection at Its Best. See page 79. Willson G Inc.

The Latest Catalog describing Automatic Adjustabl Stools for office, shop and factory. See page 107. Mfg. Co.

Literature Describing a Power Baler that saves was age space and is fire-proof is offered by Davenpo Co. See page 109.

Catalog Describing 275 Styles and sizes of oilers for a of machinery. Gits Bros. Mfg. Co. Page 79.

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When you're "20 Miles from Nowhere" on a "He" job—you'll surely need

WILLIAMSPORT WIRE ROPE

Telfax Tape Marked

Because:

You'll want to **know** the tensile strength of the wire rope you're using. Williamsport—alone—gives you this proof.

That's why "Monighan Walkers" are equipped with Williamsport Wire Rope —Able Engineers declare that taking chances on any part of their equipment particularly on isolated jobs is poor business efficiency, to say the least. They just won't do it. Others must go through the bitter experience of a tie up or accident to be convinced.

Most manufacturers of good machinery on which Wire Rope is a part of the equipment use Williamsport for your protection.

Your safety is paramount to a slight difference in cost in the minds of these manufacturers.

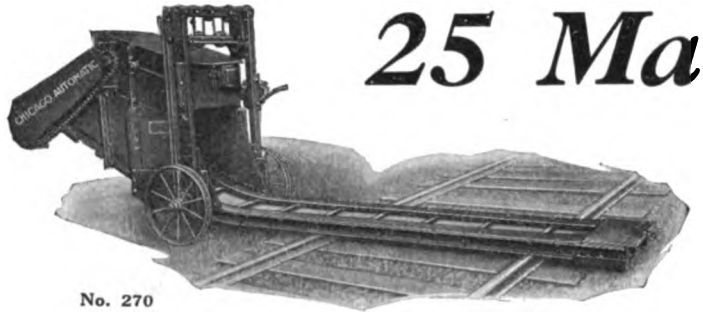
WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
Williamsport, Penna.

General Sales Offices
Peoples Gas Building, Chicago

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25 Man Power



No. 270

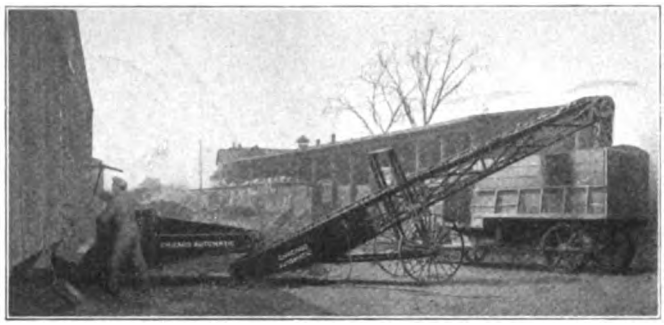
You would not put 25 men on a car of coal if you wanted it unloaded in an hour, but the

MODEL T. U. UNLOADER

will unload and clean up a car in much less time with one man, that is why you need the CHICAGO AUTOMATIC Model T. U. T. TRACKUNLOADER. NO shoveling. NO Pits. Unloads a whole car of coal in one hour. Goes under any car.

CHICAGO AUTOMATIC

The Pioneer Portable Coal Conveyor

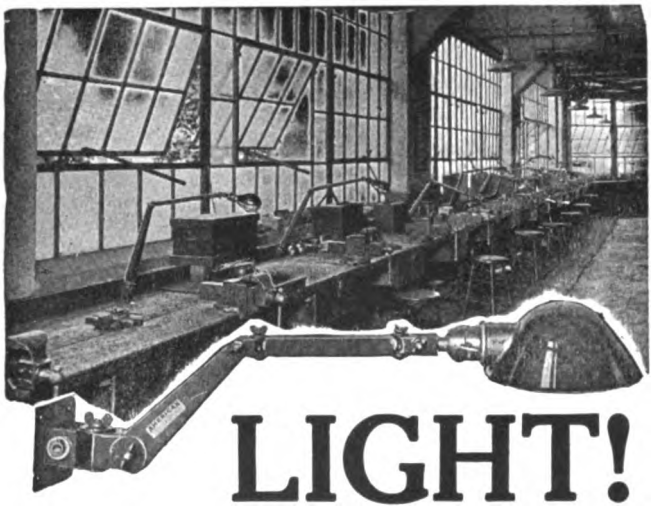


30 minutes for unloading a car. "Handles lump, slack, hard coal and coke nicely," *says Mr. Veenstra, of the Veenstra Co., Racine, Wis.*

CHICAGO AUTOMATIC CONVEYOR CO., 982 Old Colony Bldg., Chicago, Ill.

Originators of the Portable Conveyor

BRANCH OFFICES IN ALL PRINCIPAL CITIES



LIGHT!

where and when needed

Let us make a survey of your lighting needs—write today for booklets, or a representative's service, or both.

The economy of an American System as compared with a flood light system is found in the fact that the light is placed exactly where needed, and it is used only when needed.

No flood lighting of great areas with the resultant shadows on the tools just where light is most needed—but light accurately placed which guarantees greater and better production.

American Fixture Company

230 West Water Milwaukee, Wis.

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO

CANTON, OHIO

New York Office, 203 E. 15th Street

oducts not advertised in this issue write Industry Illustrated

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Hang it wherever you are now using a Chain Block

Light in weight, but substantial and highly efficient is this ROEPER Type "R" Hoist. It has very few parts. Spur Gear and Worm Driven, with the difficulty of adjustment between worm and gear eliminated.

It has a totally enclosed Dust Proof Frame and all parts automatically lubricated.

Capacities 500 to 6000 lbs., inclusive. Write for complete description.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
TRAVELING CRANES ELECTRIC HOISTS TROLLEYS

UNIQUE THIN LEAD Colored Pencils

SOMETHING wanted for years! A colored pencil with the same diameter lead as in No. 1 writing pencils: can be sharpened in a pencil sharpener to a needle point. UNIQUE has the best and *thinnest* lead.

Makes *fine lines* for figuring, checking, underscoring, blueprints, charting, etc.

The 12 colors enable executives to have their own color symbol.

At dealers, or write us direct



12 Colors

Blue	1206
Red	1207
Green	1208
Yellow	1209
Purple	1210
Brown	1212
Orange	1214
White	1215
Lt. Blue	1216
Pink	1217
Lt. Green	1218
Maroon	1219

$1.00 per dozen

AMERICAN LEAD PENCIL CO.
224 Fifth Ave., N.Y.
Makers of the famous VENUS Pencils

New!



Did you get your copy?

THE NEW BRISTO CATALOG will interest every user of set screws and cap screws. Complete information about the unique dovetailed flute socket design — the extra-small diameters—diagrams and tables, giving sizes and dimensions of threads, screws, points and wrenches—the new screw driver type of wrench—and latest price list. *A valuable reference book.*

If you want an extra copy for your Product Designer, Mechanical Engineer, Production Superintendent, or any interested factory executive we will gladly send it,—to you or direct. Send for your Bristo Catalog now. Look it over carefully when it comes and see what Bristos can do for *you*.

THE BRISTOL CO., Waterbury, Conn.

Send the new catalog of Bristol Set Screws, Cap Screws and accessories to

Firm .....

Attention .....

Address .....

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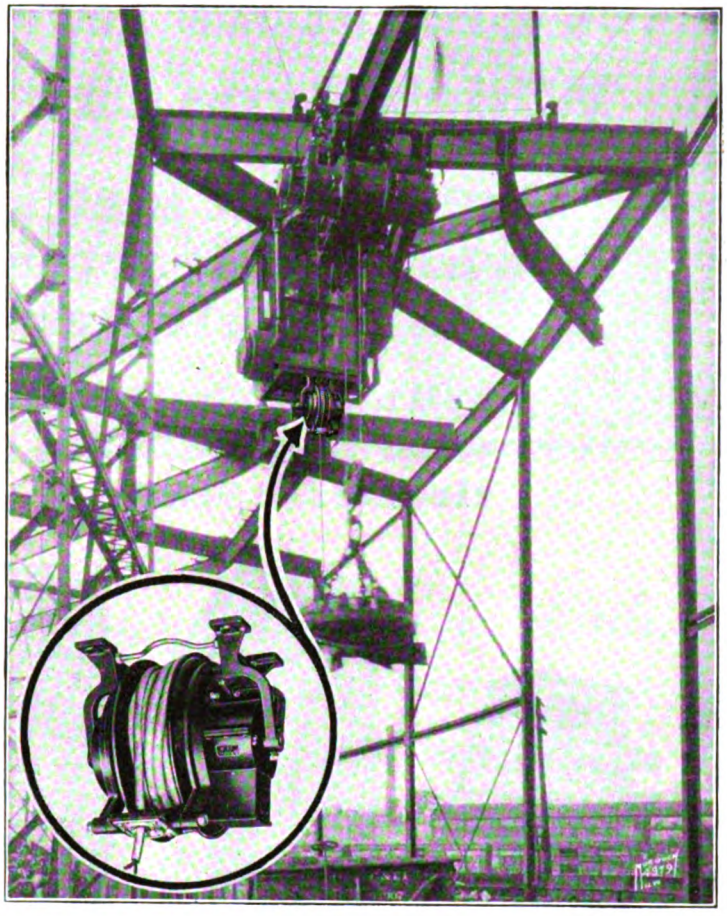
Yale & Towne Mfg. Co.....

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Reelite

The handy light on a reel
For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connector in place of light so that it will furnish current for small machinery, and portable drills, etc.



Constant Duty Type Reelite with ball-bearing cable outlet as used in connection with monorail overhead traveling crane.

Whenever power must be supplied to a lifting magnet—Reelite!

Reelites furnish the elastic, unbreakable connection between generator and motor in those plants where careful attention is paid to maintenance leaks.

For Reelites save cable-renewals at such a rate that they pay for themselves in a year or two, sometimes in a few months.

No costly layoffs of machinery while new cable is installed. Reelites *preserve* the cable, handle it with care, run it over ball-bearings, wind it up when not in use. They're mechanical caretakers.

The convenience, economy and safety of such an installation as that shown above can scarcely be overstated.

Once you have tried Reelites you will begin *looking* for places to install them.

They come in all sizes, from those types for use with a drop-cord light, to the Constant Duty types that supply high-tension current to lifting magnets and portable machinery.

Drop us a line for further information. We feel sure that *you'll* find an investigation of Reelite will be time well spent. Send for literature.



New!
Send for Bulletin 501-S which fully describes all models of Reelites.

APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue, Chicago, U. S. A.*
New York—150 Varick St. Los Angeles—340 Azusa St.

CONSTANT DUTY

Reelite

REG. U. S. PAT. OFF.

Carries Current Where Needed

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Bucket Elevators for Every Service

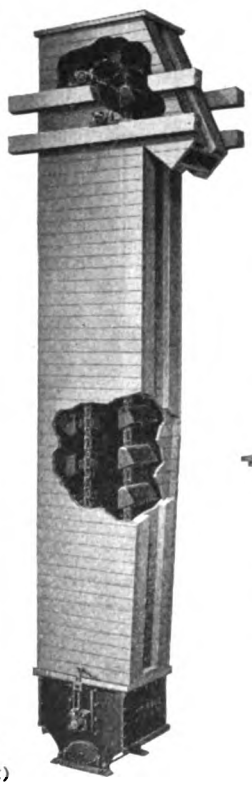
Which Type Can You Use?

Built to the high standard which characterizes all Link-Belt Products

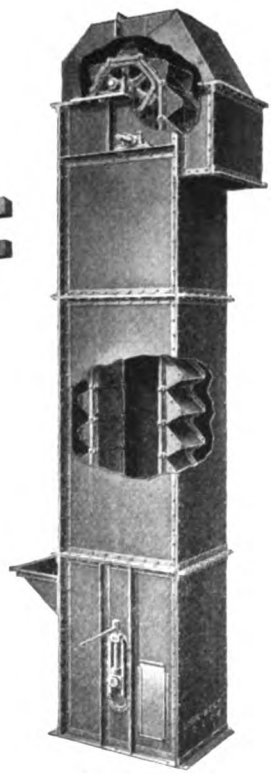
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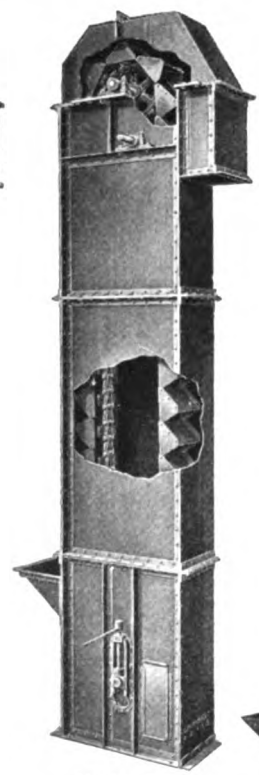
Centrifugal Discharge. (Steel Casing)



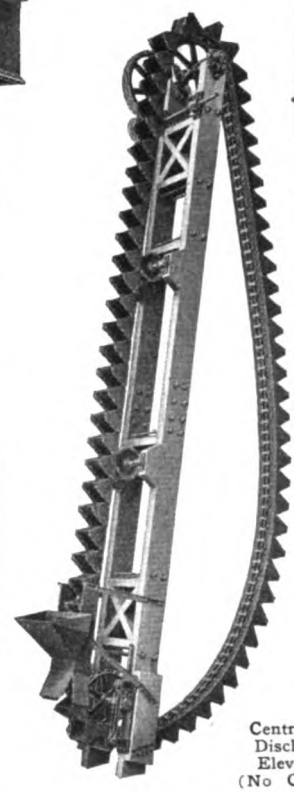
Centrifugal Discharge. (Wood Casing)



Double Strand Vertical Continuous Bucket Elevator.



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Centrifugal Discharge Elevator. (No Casing)



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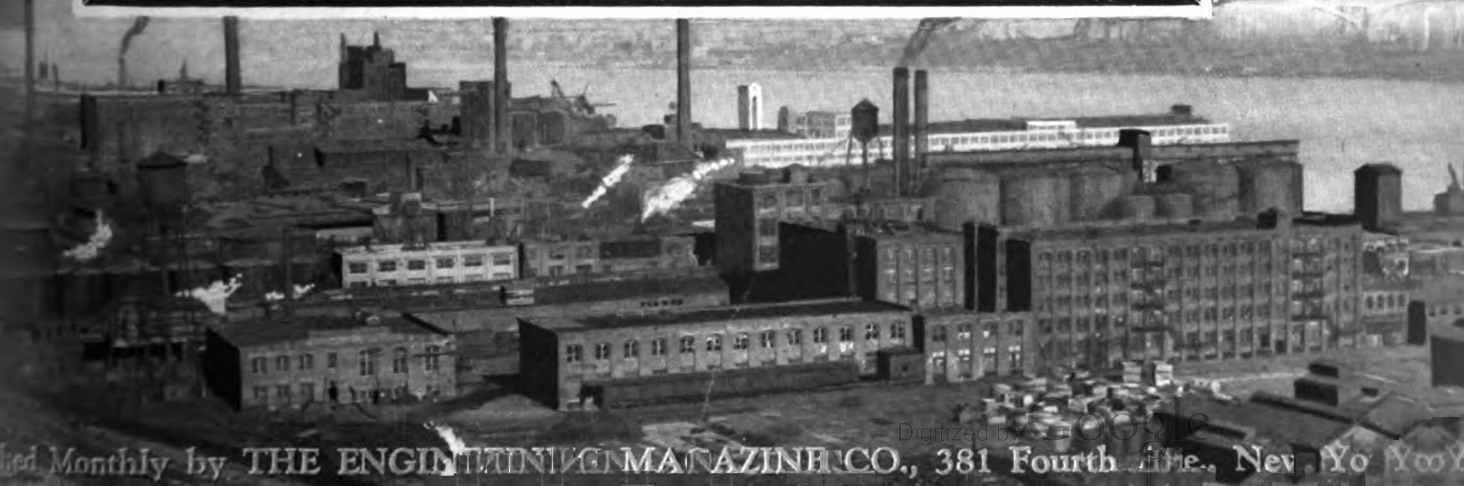
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Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

When a man reaches eminence in his chosen field, only to be cast down from that eminence into apparent oblivion—and then proceeds to "come back with both feet"—there is something more than mere ability back of it.

Such a man is William C. Durant, who has undertaken to challenge those two giants of the automotive world—Henry Ford, and General Motors Corporation. On page 9, of this issue, is a story of this remarkable personality, and the situation he has created.



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WRENCHES



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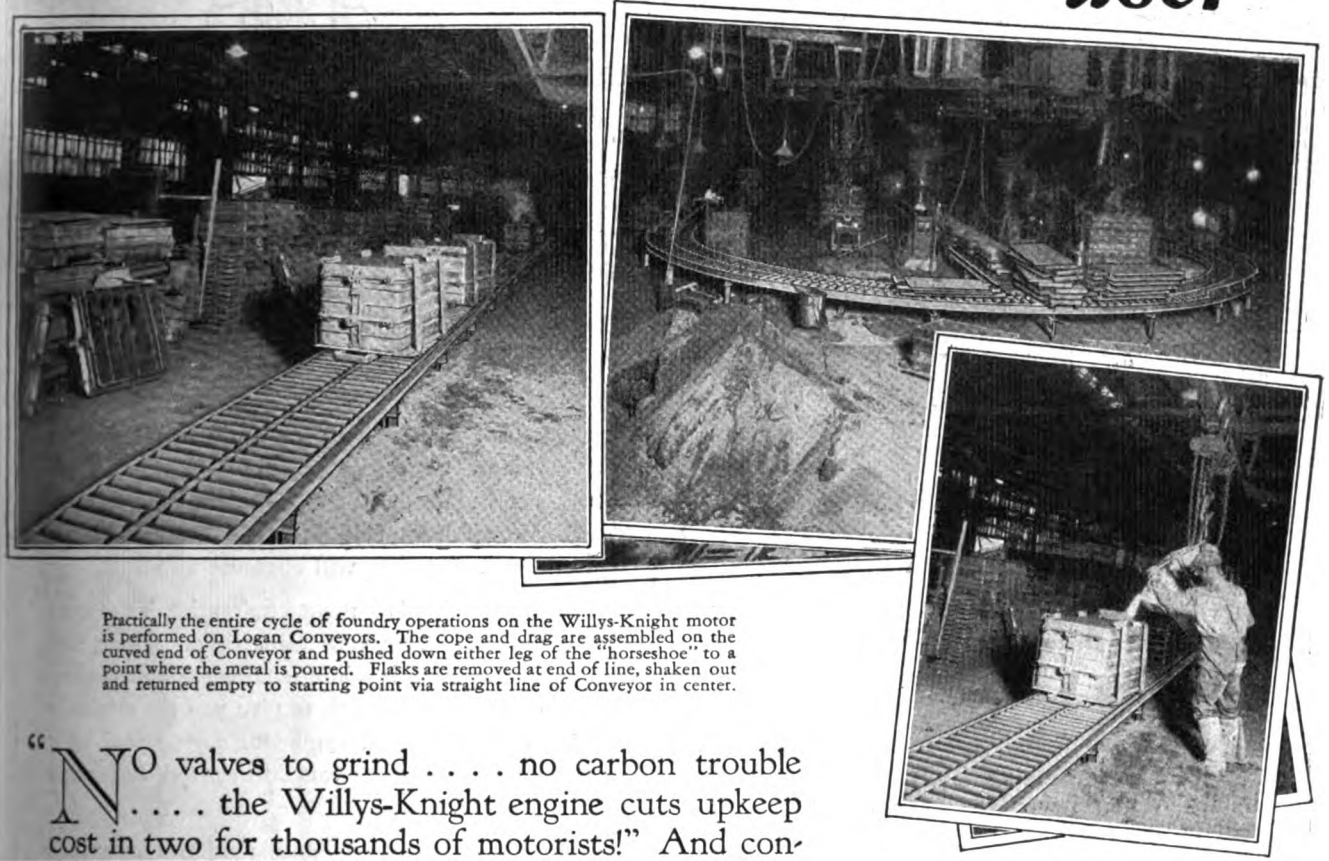
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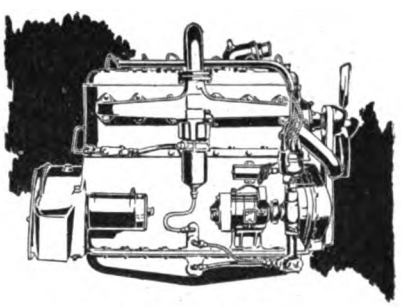
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WILSON FOUNDRY—another user



Practically the entire cycle of foundry operations on the Willys-Knight motor is performed on Logan Conveyors. The cope and drag are assembled on the curved end of Conveyor and pushed down either leg of the "horseshoe" to a point where the metal is poured. Flasks are removed at end of line, shaken out and returned empty to starting point via straight line of Conveyor in center.

"NO valves to grind . . . . no carbon trouble . . . . the Willys-Knight engine cuts upkeep cost in two for thousands of motorists!" And consistent with this characteristic of their product, the Wilson Foundry & Machine Co., makers of the famous Willys-Knight motors, are quick to realize the importance of keeping their own operating costs to the minimum. The three photographs above show how Logan Conveyors are facilitating production and cutting out unnecessary handling in the Wilson plant at Pontiac. Motors or milk, shoes or sugar—whatever your business, it is probable that Logan Conveyors can be effectively adapted to *your* product and *your* plant. Write for *"Seven Economies of Logan Conveyors."*



SOUND materials—conscientious, dependable workmanship—these essentials in the success of "the motor that improves with use" are the contributions of the Wilson Foundry & Machine Co., sole makers of the Willys-Knight motor. Although probably unknown to many of the thousands who praise its product, Wilson Foundry has become a real power in the automobile world through sheer good work and the constant adoption of the most modern manufacturing methods.

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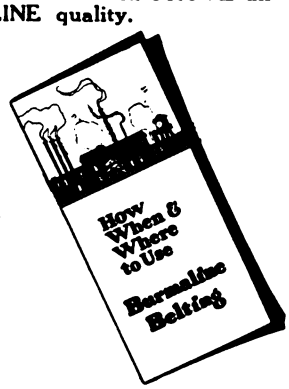
Draw Knife Test
Toughness Test No. 1.

TOUGHNESS, with the desired pliability, is a prime requisite of long lived, economical belting and an outstanding feature of BURMALINE BELTING.

Make This Practical Test:

Send for a sample of BURMALINE BELTING. When it arrives take a sharp knife and try to cut it, either with, or against the length of the belt as shown above. This will demonstrate the toughness of the materials used.

NEXT take pieces of other kinds of belting you are using. Note the difference. This is a practical—not a meaningless—test that will PROVE an important-to-you BURMALINE quality.



BURMALINE BELTING WILL give you the same or longer life, AT LESS COST, than any other type of belting you can buy. Withstands heat, oil, dust and acid fumes. Made in only one grade—in various standard thicknesses of SINGLE, LIGHT DOUBLE and DOUBLE. Continuous lengths with NO LAPS or SEAMS. Excellent suction on pulleys.

The BEST practical test for a BURMALINE BELT is to install one on any but a short quarter turn drive. It will not pull crooked, but on 95% of your drives, it will give such excellent service, calling for no attention, that you are sure to install others.

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Your Jobber's Salesman Will Give You Full Information.

BURRELL BELTING COMPANY

Manufacturers of Burmaline Belting—Alfalfa Belting—Ebony Transmission and Conveyor Belting—Universal Belt Oil and E-Z Grip Transmission Lining for Ford Cars and Trucks

416 South Hermitage Ave., CHICAGO, ILL.



Profits

AS the first quarter of the year comes to a close manufacturers are becoming more and more convinced that 1927 will be a year of general prosperity.

But as some one has aptly said, it will be one of "prudent prosperity." Profits will depend more and more on manufacturing costs. Wages have held firm and every indication shows that they will continue so.

How is *your* plant equipped to meet competition? Are your transmission, power, production and handling equipment and machinery efficient enough to give you the minimum costs? Are you employing high priced labor where machinery can do the work better and cheaper?

The equipment and machines advertised throughout this publication are helping manufacturers toward greater profits. "Where to Buy" such equipment will be found on pages 108—110—112—114.

Harvey Conover Jr.
Business Manager.

Industry Illustrated

Published Monthly by

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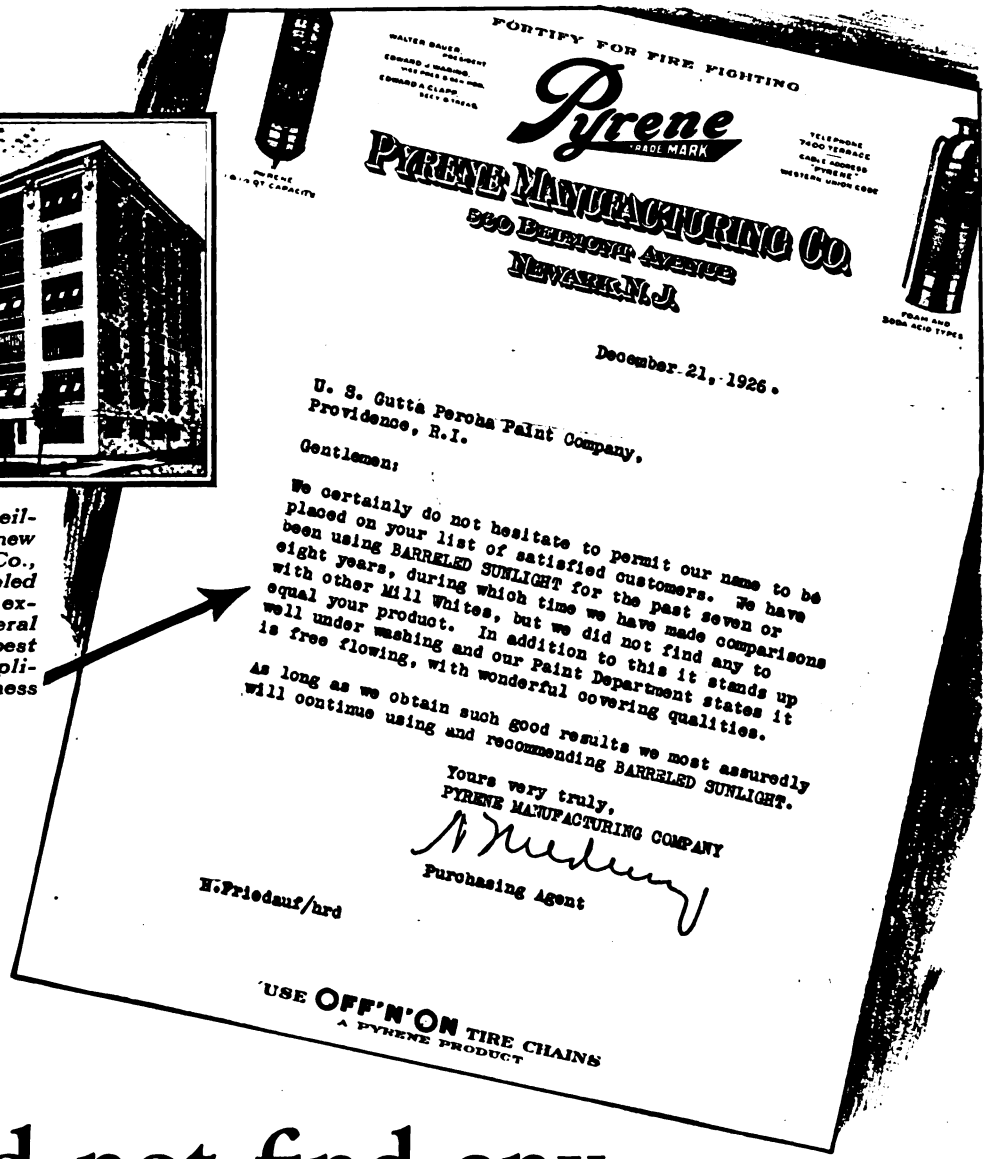
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When it came to painting ceilings and walls in this fine new plant of the Pyrene Mfg. Co., Inc., at Newark, N. J., Barreled Sunlight was chosen because experience over a period of several years had proved this paint best in covering power, ease of application, and lasting cleanliness



FORTIFY FOR FIRE FIGHTING

Pyrene TRADE MARK

PYRENE MANUFACTURING CO.
560 BELMONT AVENUE
NEWARK, N.J.

December 21, 1926.

U. S. Gutta Percha Paint Company,
Providence, R.I.

Gentlemen:

We certainly do not hesitate to permit our name to be placed on your list of satisfied customers. We have been using BARRELED SUNLIGHT for the past seven or eight years, during which time we have made comparisons with other Mill Whites, but we did not find any to equal your product. In addition to this it stands up well under washing and our Paint Department states it is free flowing, with wonderful covering qualities.

As long as we obtain such good results we most assuredly will continue using and recommending BARRELED SUNLIGHT.

Yours very truly,
PYRENE MANUFACTURING COMPANY
Purchasing Agent

H.Friedauf/hrd

USE OFF'N'ON TIRE CHAINS
A PYRENE PRODUCT

"We did not find any to equal your product"

THE Pyrene Company's satisfaction with Barreled Sunlight for painting ceilings and walls is shared by leading plants in almost every industry today.

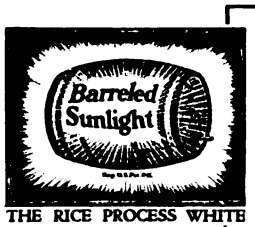
Not only does this dirt-resisting, washable white paint insure a longer period of cleanliness and adequate light-reflection without repainting, but it also *costs less to apply* than other gloss paints. Quantity for quantity, Barreled Sunlight covers a larger area, and it flows on so freely with brush or spray that many labor-hours are saved.

Guaranteed to remain white longest.

Sold in large churn-equipped steel drums and in cans. Where more than one coat is required, use Barreled Sunlight Undercoat first. See coupon.

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Barreled Sunlight
Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

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5 Dudley Street, Providence, R. I.

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Drip—drip—drip—all day, and every day. Right through the year—the ceaseless drip—drip—drip of oil from babbitt bearing hangers—damaging goods in process of manufacture and eating into profits.

The Skayef Ball Bearing Hangers were brought in—to plug the leak. They *Did.*

Recently the owners of this South Carolina mill reported:

"We find there are fewer seconds from oil drippings where we are using Skayef ball bearings. This item cannot be determined exactly, *but we estimate very conservatively the saving amount to $275.00 a year.*"

That is, an approximate saving of $1,400 ove the 5-year period!

This is not the *only* saving Skayef has affecte in this textile mill. Skayef Self-Aligning Ba Bearing Hangers have saved *power—oil—labo*

The reduced friction of these bearings has cu the load from 42.5 H. P. to 36 H. P., a saving 15.3%. Oiling labor has been reduced 87½ and oil consumption cut 77%.

Certified Survey No. 1777 in your Industry or one closely related to it, sent on request.

1777

SKF

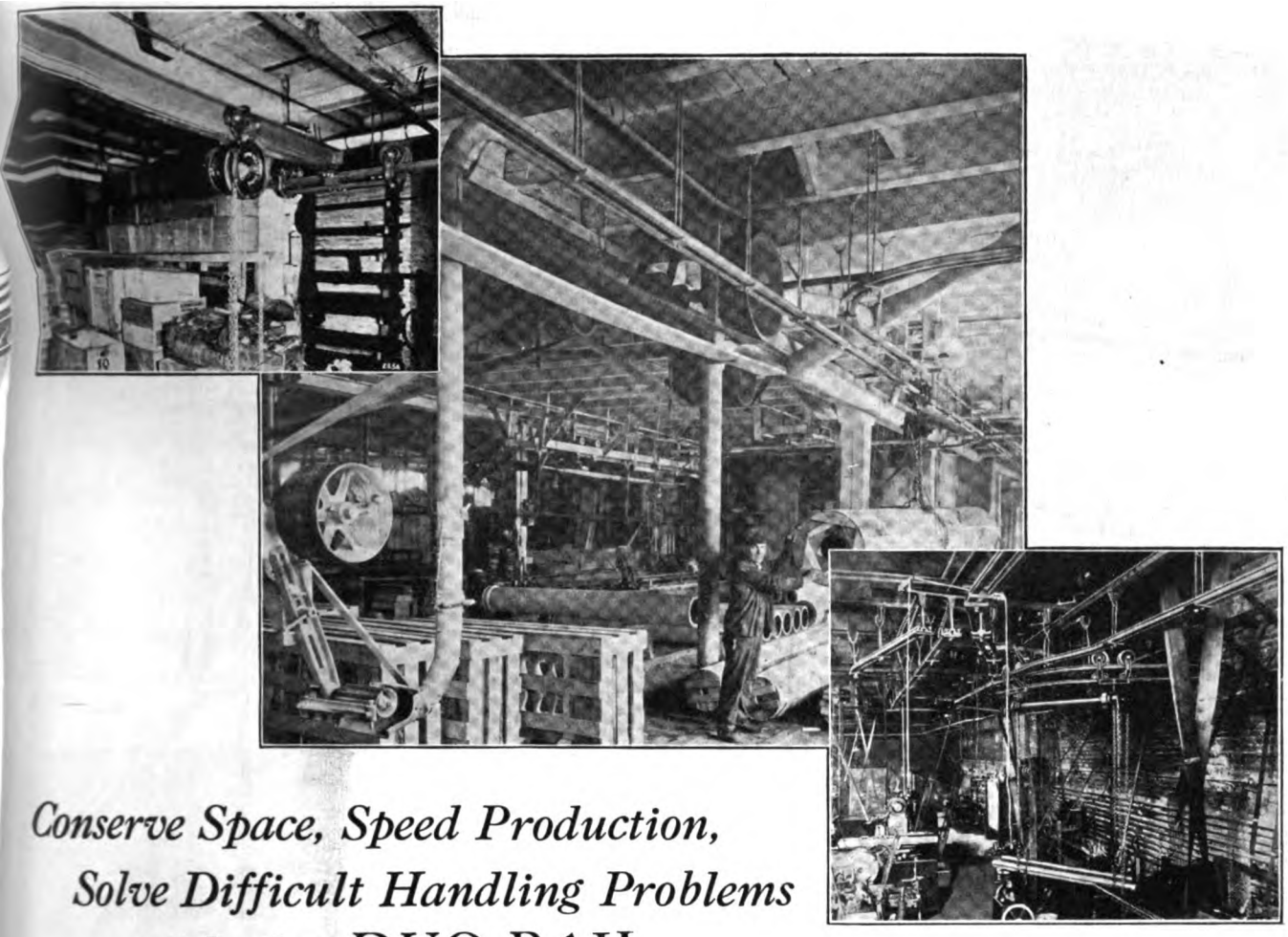
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Conserve Space, Speed Production, Solve Difficult Handling Problems with the DUO-RAIL

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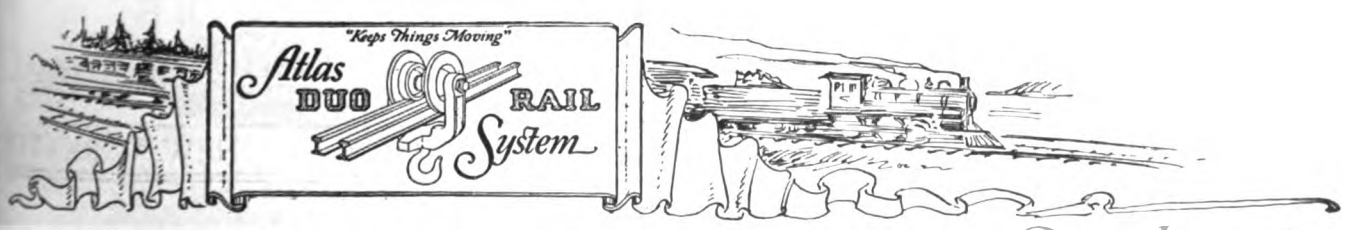
The rails in the DUO-RAIL System are staggered, exactly as in railroad track. It results in safer, steadier, more efficient handling, with absolute freedom from vibrations and sudden jars when materials are handled around sharp turns.

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"The ATLAS of Mechanical Conveying." It is free.

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HUNDREDS of illustrations tell thousand word stories at a glance. Handling everything from Coal to Bananas. Several pages illustrate standard Conveyors with various additions which have successfully solved many problems.

YOU will find things of great interest and profit to you in this New Catalog—Cheerfully sent on request.

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PORTABLE CONVEYOR SPECIALISTS

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Industry Illustrated

Modern Methods and Equipment

For Mill, Shop & Factory

JOHN R. DUNLAP *Editor*

W THOMSON LEES *Associate Editor* WILLIAM W. BAXTER *Associate Editor* ADOLF SCHILDKRAUT *Art Director*

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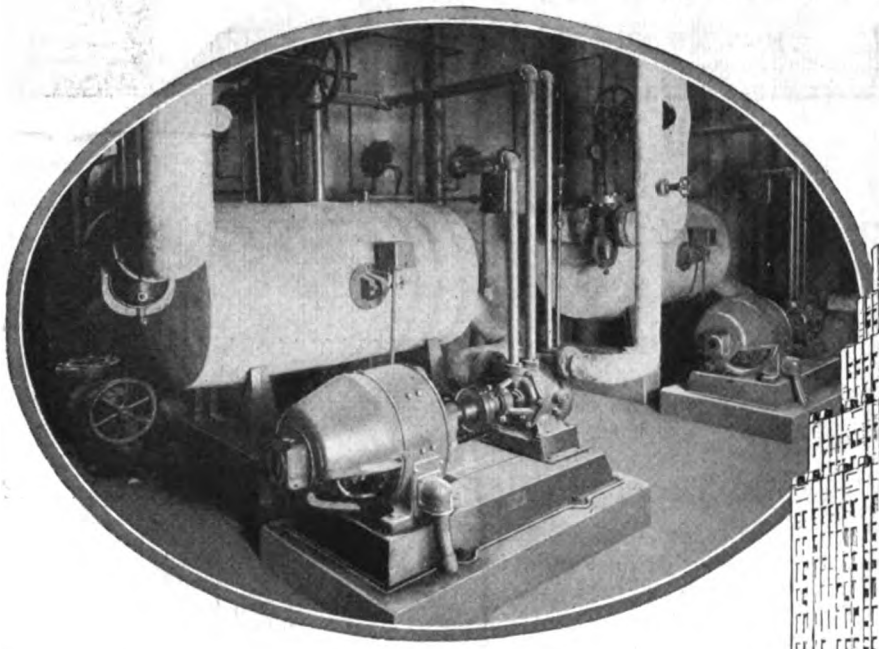
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At the cross-roads of the world

In Times Square, in the heart of New York's Great White Way, there stands the new Paramount Building—the home of the Famous Players-Lasky Corporation—symbolizing the marvelous development of the motion picture industry in the country.

And there, too, you will find Jennings Vacuum Heating Pumps. For, in the Paramount Building Jennings Pumps are depended on not only for removing the wet returns from the heating system, but also for providing those economies and benefits, so contributory to good heating, which characterize Jennings equipment.

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ABOVE. *The new* PARAMOUNT BUILDING, *Broadway, 43rd-44th Streets, New York, N. Y., Paramount-Broadway Corp'n,* OWNER; *C. W. & George L. Rapp,* ARCHITECTS; *R. E. Hall & Co., Inc.,* ENGINEERS; *Thompson Starrett Co.,* BUILDERS.

OVAL AT LEFT. *Two of three motor-driven Jennings Vacuum Pumps, installed on the return line of the vacuum steam heating system in the new Paramount Building. Two of these units are each rated for* 100,000 *sq. ft. equivalent direct radiation; the third unit for* 16,000 *sq. ft. Discharge against* 50 *lbs. per sq. in. pressure.*

Jennings Pumps

RETURN LINE AND AIR ' ' **PUMPS CONDENSATION AND CIRCULATING PUMPS**

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Durant—The Man Who Wouldn't Stay Down

The Stormy Petrel of the Automobile World

By George Edwards

RUNNING true to form, William Crapo Durant has come back—again. The announcement of his Consolidated Motors Incorporated has set Wall Street guessing.

What does it mean? What other companies will be taken in with Durant Motors? And what will be the final outcome—a three-cornered battle between General Motors, Ford and the new corporation, or an amalgamation which will control the whole industry? Of one thing the stock market is entirely certain: That, whatever his plans may be, W. C. Durant will carry them through.

For this supreme organizing genius has not yet failed at building up. Indeed, he would not have failed at holding on, but for the dominance of certain elevated principles in his make-up. He *would* sacrifice his own immense fortune to save the day, but he would never sacrifice those who believed in him.

Back in the days when he and J. Dallas Dort were operating the Durant-Dort Carriage Company, started on a capital of $2,000, they went into the bicycle business as a side line. Friends of the two, in Flint, bought stock in the new company, which soon passed out with the bicycle craze. Under no obligation to do so, except that which lay within themselves, the two future motor magnates returned to their stockholders every dollar they had invested. That obligation to see his friends safely ashore, before he leaves the ship, is a ruling trait in the character of W. C. Durant.

A better understanding of the probable goal of his latest consolidation and the practical certainty of its success, may be gained from a brief review of his tremendous achievements of organization, his defeats and his invariable retrievals of success.

His modest entry into motor-car manufacture occurred as a result of his reorganization of the Flint Wagon Works in 1903. He had been called upon to extricate this company's affairs from a state of confusion which threatened ruin. Given full control, he succeeded in setting the company on its feet, for which he received some $202,000 worth of common stock. This he turned over to the Durant-Dort Carriage Company, because he felt

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that *he was working for his associates as well as for himself.*

The Flint Wagon Works had started to manufacture Buick cars. Durant continued to make them. The output grew from 28 cars in 1904 to 3,450, three years later. Foreseeing that the automobile would become a universal necessity instead of a luxury or a fad, Durant went on expanding. Building after building was added to the plant until the present, enormous Buick works at Flint, were about completed.

Meanwhile his irrepressible creative genius was urging him to acquire control of the manufacture of other cars. He did, purchasing first the Cadillac, then a by-word and a scorn. The Oldsmobile, which was anything but a shining success, came next. Then followed the purchase of the Oakland, which had been about ready to go under the hammer.

These transfers took place with such speed that their purpose remained a secret, until the day in October, 1908, when Durant was ready to announce the General Motors Corporation, capitalized at $10,000,000.

At once, predictions blossomed forth that so cumbersome an organism would defeat its own purpose. In brief, it would not pay. But it did pay, and at once. The net profits of the first year's business exceeded the total capitalization by $500,000. The second year's business reached $50,000,000, with net profits of $11,000,000 plus $1,000,000 set aside as a contingency fund.

THE BATTLE OF THE TITANS

General Motors sales have outdistanced Ford's, two to one. Re-enter the man who made General Motors what it is, with a new consolidation of his own—Consolidated Motors Inc. If he could once make the power which dominates the automotive industry, can he now unmake it through a more powerful successor? No one person—not even Henry Ford—has demonstrated greater organizing genius. The battle is joined. Who will win?

In the third year came Durant's first disaster. General Motors' working capital had come from bank-credits and not from new stock. Consequently, when the banks got together and curtailed or suspended credit, the storm-clouds gathered rapidly. This was in 1910.

There is no need of dwelling upon the reasons adduced for the credit suspension. It is enough to say that interests came forward ready to advance $15,000,000, for which they demanded voting trust control. Durant retired as active head, being succeeded by his own choice, C. W. Nash. For five years, General Motors earned but paid no dividends. At the end of that period, its stock, par 100, stood at 24.

During the course of 1915 this inactive stock began to show signs of life, which progressed with such increased vitality that it eventually reached 264. General Motors stock was being bought in blocks as soon as it appeared on the market.

Finally the news spread that the Chevrolet Motor Co. had acquired control of General Motors. To the man on the street, this sounded ridiculous. Chevrolet could not possibly have that much money. But Chevrolet had. In fact, its assets were $94,000,000. *It had been organized fifteen months before by W. C. Durant.*

He was again in the saddle, where he remained five years. And again the business burgeoned forth. By 1920 it was almost ten times as great as in 1915. Then came the [illegible].

The unfortunate conjunction of a policy of over-expansion and a year of depression brought the affairs of General Motors to a crisis. The stock began to fall, and, as it fell, there was a rush of panic-stricken stockholders, ready to sell at any price.

Durant stood in the breach and as fast as stock was unloaded, he bought it up. He executed prodigies in raising cash and collateral. But the rush was too much, even for him and his recources. When he had spent his entire fortune of $90,000,000 and gone into debt for more, he was through—for the time.

Within two years he had organized Durant Motors, Incorporated, and was doing an annual business of $50,000,000. A year later he was manufacturing the Durant, Star and Flint cars, the Locomobile and the Mason truck. Since the incorporation of Durant Motors, he has been acquiring control of companies making parts, to insure his source of supply, much as he did for General Motors.

Among these subsidiaries are: American Plate Glass Co., New Process Gear Co., Warner Co., Motor Parts Corp., Adams Axle Co., and others. This is the nature of the nucleus about which he will build up Consolidated Motors; this, and the $40,000,000 he is reputed to have made by stock operations in Wall Street.

Characteristically, Durant has announced that he will pledge his entire personal fortune as a guarantee of the financial responsibility of his new corporation. A large block of Durant stock will be set aside to further the project. The annual profits on this stock will be distributed among Star dealers. According to the finance plan buyers of stock may purchase on a time basis, at 6 per cent. All other charges, including insurance, will be borne by himself.

Coupled with this is the announcement that he will resign directorships in companies which have little or no bearing on motor car manufacture, and devote himself exclusively to Consolidated Motors. This brings history up to date.

Now let us glance at the field of combat, the motor car industry, and the line-up of the forces preparing for a struggle for supremacy, whose like must be sought in the fighting days of the Standard Oil and the United States Steel Corporations. Perhaps we can then form a more accurate estimate of the part Durant will play in the combat.

Before the organization of Consolidated Motors, the field was held almost equally by Ford, General Motors and a third group including all other manufacturers (about 80). In 1922, Ford produced 63.8 per cent. of the nation's annual output of motor cars, General Motors 14.1 per cent. and all the others 22.1 per cent. According to figures quoted from an article in the American Bankers Association Journal, the ratio for 1925, in the same order was: 46.—20.1—33.9. In 1926 it was 30.—28.4—35.1.

The decrease in Ford sales from 1,798,123 in 192[illegible]

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to 1,447,915 in 1926 represents a loss of about 19 per cent.

The gain in General Motors sales in the same period (exclusive of trucks, which are included in the Ford figures) was: 787,000 in 1925 to 1,121,000 in 1926, an increase of about 42 per cent.

Furthermore, the General Motors Corporation earned a net profit of $183,679,000 in 1926, the largest in its history. The earnings of the Ford Company during the same period were $80,000,000 in round figures.

This is the situation at the front, as Durant leads his Consolidated Motors into the line. The motor-car companies, composing it, are among those, which, together, turned out 28.4 per cent. of all the cars produced in 1926, against Ford's 36.6 per cent. and General Motors' 35.1 per cent. If he combined them all, without increasing their output, he would still be a bad third in the race. But, of course, he will hardly do either.

What he will do depends largely, one would believe, upon his analysis of the capacity of the markets, both domestic and foreign, to absorb the tremendous output which his system of standardization, large-scale production and, especially, of selling, would immediately engender.

Last year's production for the United States was not far from 4,000,000 motor cars and trucks. The total number of cars in the country is about 16,000,000. Neglecting the foreign market, the present rate of production would be sufficient to effect a complete replacement of all vehicles, every four years. This would check with sound automobile practice, for the average depreciation of a car is accepted as 25 per cent. per annum.

It is not to be thought that Durant would enter the field with a strong amalgamation of companies, besides those he already owns, without setting out to obtain greater production than any of his present or future holdings had ever turned out. This would mean that the annual national production would be steadily increasing.

What class or classes of cars would make up this increased production? What reserve capacity has the market to absorb them?

The falling-off in Ford's business and the increase in that of General Motors may have some significance to one searching for answers to these questions. Ford has a one-class product, which, it is true, is within the capacity of every pocket-book. It is equally true that, if the buyer had a choice, he would prefer to spend more and get another type of car. The product of General Motors, on the other hand, ranges from the high-grade heavy cars, through the intermediate classes, to something comparable with a Ford.

Variety of class, therefore, will characterize the output of any organization which sets out to capture a share of the motor-car business as great as that of General Motors. Not that *all* classes of cars will be included. On the contrary, the extremes will probably be dropped, and the variety limited to the intermediate classes, with extra stress upon those which can be made to be sold to that great body of purchasers who want a low-priced car but not the cheapest they can buy.

It is possible that the Star will be that low-priced car, or that other models will be developed by Consolidated Motors. Whether it will be the Star model or not depends upon W. C. Durant's judgment. How clear that judgment is; with what resources of intelligence, capacity to organize and finance, ability to assemble cooperative talent and knowledge of sales methods, it will be supported, has been amply demonstrated in the past.

This time, Durant is not depending upon the coffers of the bankers, nor upon their somewhat limiting views of what he should or should not do. His is a going concern, backed, as has been said, by his own financial resources. He will take the public, *directly*, into the fabric he has created. Thus, he will be independent of the elements which, in the past, have more than once brought about his downfall—for the time being.

He will not take that risk again. He wants to deal fairly, and to be dealt with just as fairly. There is no incentive to him quite comparable with the satisfaction of expressing his peculiar genius for organization by the creation of a machinery for supplying a universal popular demand.

Times change. The unexampled prosperity of America, brought about, in part, by the very fact that such immense sums have been expended on motor-cars, has increased individual purchasing power to the point at which it demands something more than the cheapest in those same motor-cars.

Durant knows General Motors better than any other human being. He should, as its creator. And he knows the brains behind it. He should, for those brains outwitted his rugged principles.

If there is any one individual who has not only a complete knowledge of the field of battle, but of the disposition of the opponent forces and the quality of its high command, Durant is that man. With his experience, knowledge and ability, it would be a reversal of all industrial logic if he does not succeed in becoming a dominant factor in the entire automotive industry in the United States.

William Crapo Durant has indeed come back—this time, apparently, to stay.



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Anti-Friction Bearings and Their Application to Mechanical Equipment

By G. A. Ungar

THERE is no more striking illustration for the influence of automotive vehicles upon mechanical design than the development of the anti-friction bearing during little more than the last quarter century.

The bicycle as the forerunner of the automobile with its motive power limited to the muscle power of the rider brought with it the first successful mechanical solution of a ball bearing carrying comparatively heavy loads in a rather restricted space. At the same time modern precision and quantity production methods were first employed here for the manufacture of ball bearings.

That anti-friction bearings are successfully available today to the machine builder for service conditions of the severest nature is due to the automotive industry, where the large market possibilities made the costly coöperation between designer, mechanical and metallurgical laboratory, the steel mill and the machine shop with both precision and quantity production economically possible.

Anti-friction bearings can be principally divided according to the rolling elements into ball bearings and roller bearings and each group can again be subdivided, according to (1) the number of rows of rolling elements into (a) single row and (b) two or more row bearings and (2) the direction of the load.

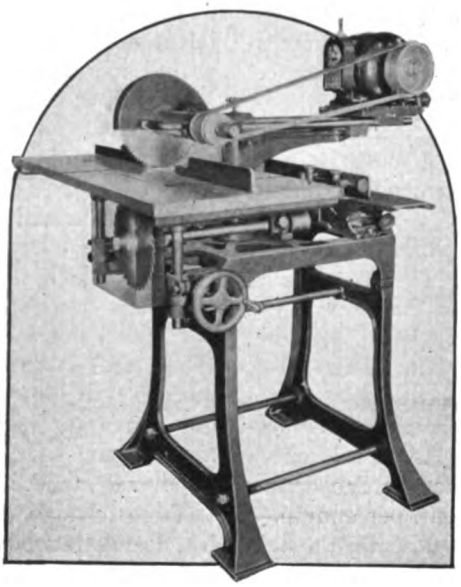


Fig. 1. A high speed circular saw, the mandrels of which are mounted on open and closed type ball bearings of approximately one inch shaft diameter.

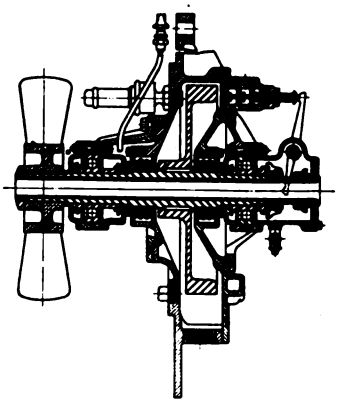


Fig. 2. A cross section of an oil burning turbo-blower for oil burning battleships mounted on ball bearings.

Group 2 is divided into:

(a) Radial or annular bearings (the load carried is at right angles to the bearing axis).

(b) Axial or thrust bearings (the load is in the direction of the bearing axis).

(c) Angular .or combination bearings (the load direction is at an angle to the bearing axis).

In the last two groups there is a further subdivision according to (a) thrust being carried only in one direction or (b) in both directions.

While in ball bearings the angle of the race contacts with the bearing axis determines the direction of the load which it will sustain, it is chiefly the type of the rollers employed which determines the load direction of roller bearings.

(a) Radial bearings employ cylindrical rollers.

(b) Axial bearings employ tapered rollers.

(c) Angular bearings employ taper rollers or cylindrical rollers with flanges (on either rollers or raceways) or rollers with curved profiles (barrel or hourglass shape may be used.

The features of anti-friction bearings and their suitability for a given application can be determined by a consideration of the following factors.

Both ball and roller bearings are capable of sustaining heavy loads and as a general rule it may be stated that for a given size roll

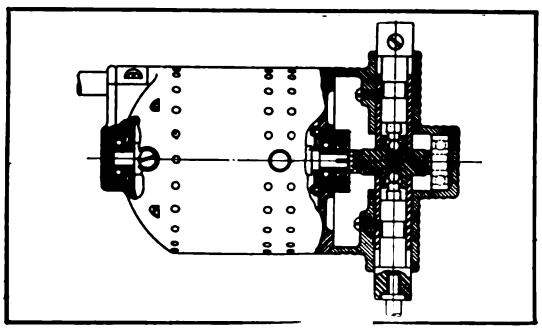
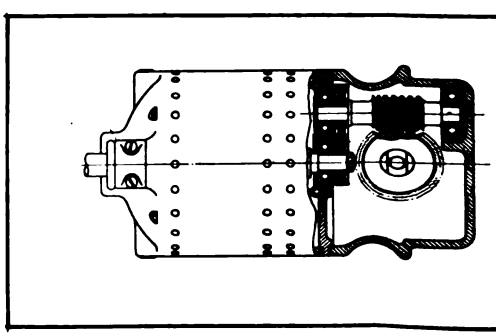


Fig. 3. A sectional view of an electric screw driver. Both the armature and the reduction gear shafts are mounted on ball bearings.



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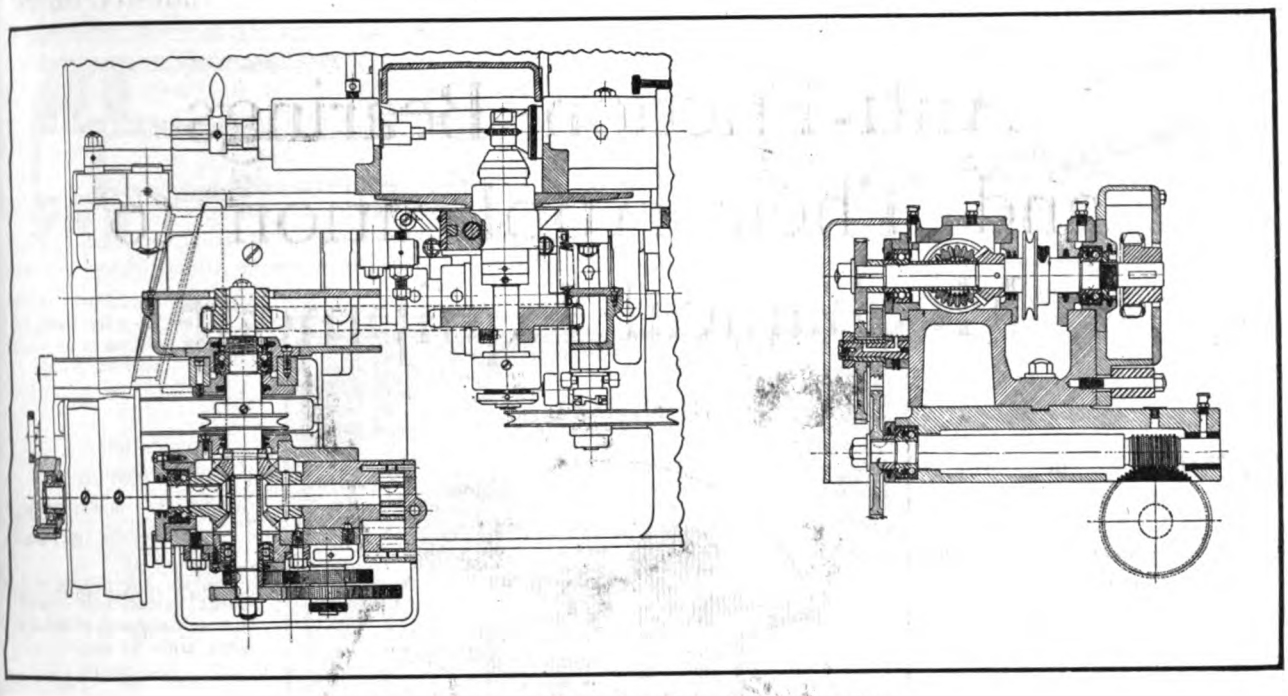


Fig. 4. A sectional view of a four inch gear cutter equipped with ball bearings.

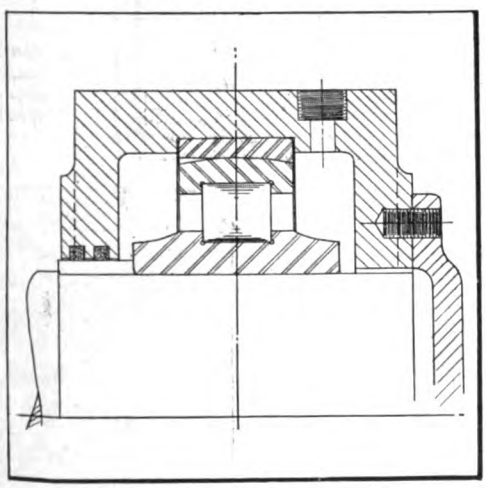


Fig. 5. A sectional view of one of the trolley wheel roller bearings used on a 90 ton ore bridge bucket.

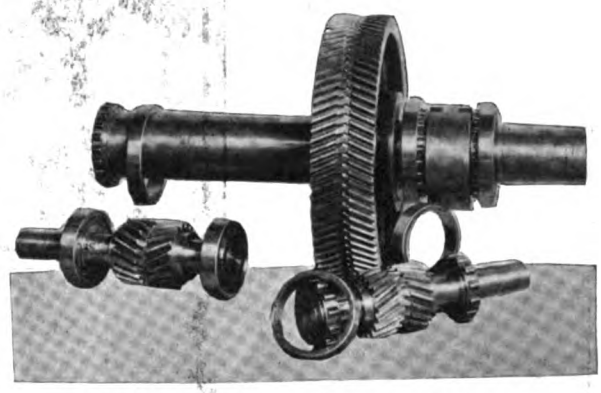


Fig. 6. The parts of a duplex herringbone reduction gear unit mounted on roller bearings.

Fig. 7. A cross section of a heavy duty worm drive mounted on ball bearings.

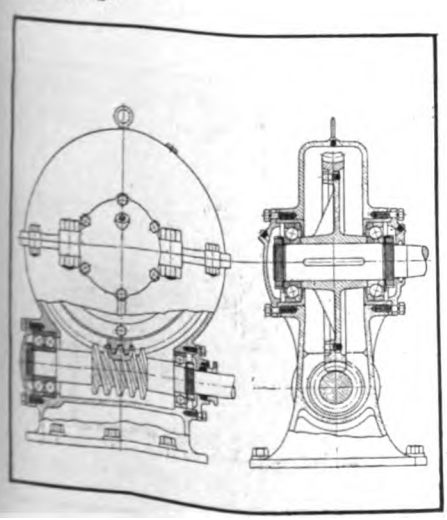
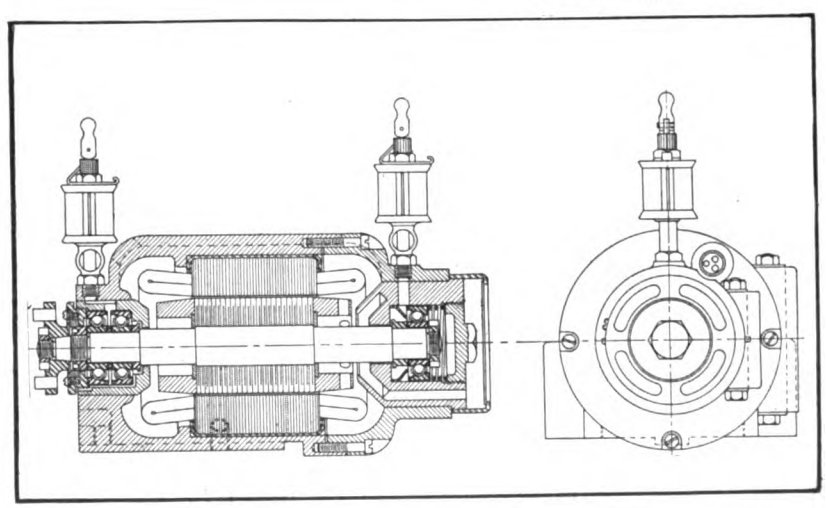


Fig. 8. A sectional view of a high frequency induction motor mounted on ball bearings.



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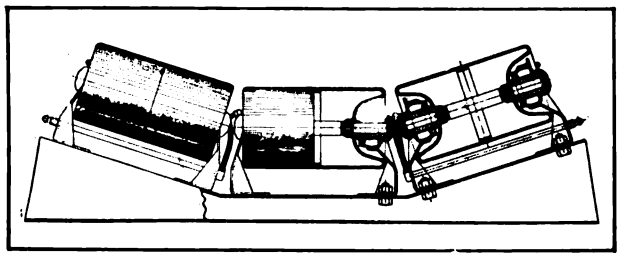


Fig. 9. The pulley idlers of a 42-inch belt conveyor mounted on roller bearings.

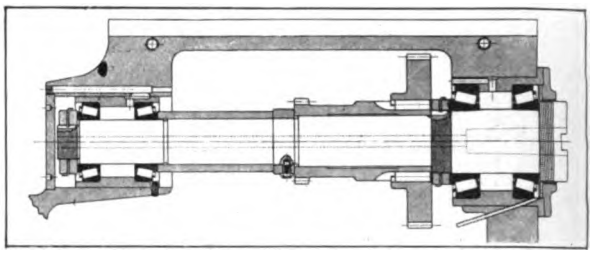


Fig. 10. A cross sectional view of a four-bearing milling machine spindle mounted on roller bearings.

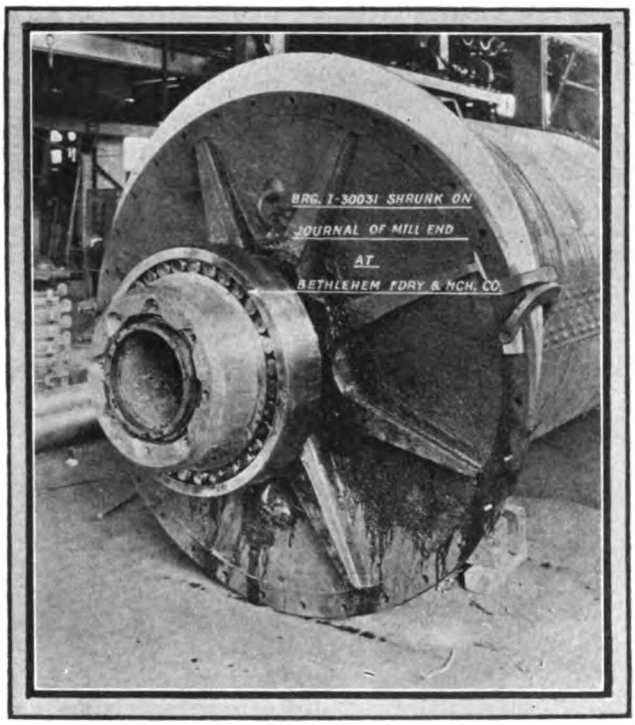


Fig. 11. The charging of a large cement mill mounted on self-aligning roller bearings with the bearing housing removed.

Fig. 12. The rotor of a large submarine motor mounted on self-aligning ball bearings. Large thrust bearings are also provided to compensate for the heavy axial thrust.

Fig. 13. A view in the inspection department of a bearing manufacturing plant showing the method of inspecting the outer race for roundness.

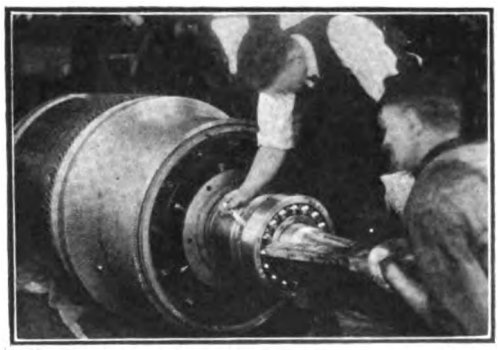


Fig. 14. Final inspection of ball bearings before wrapping for shipment.





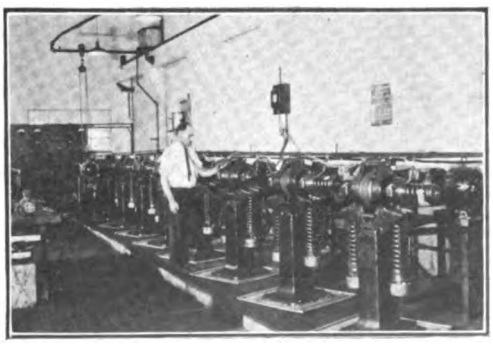


Fig. 15. A battery of ball bearing testing machines. Both radial and thrust loads are applied by means of springs. A stethoscope is used to d bearing noises.

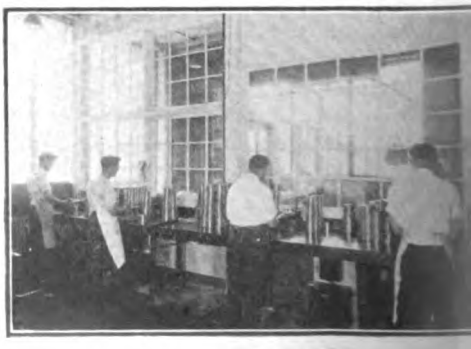


Fig. 16. Production inspection of ba bearings for noise by placing the upon arbors revolving at high spee

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bearings have a greater load capacity than ball bearings.

Ball bearings are well adapted to operate at high speed and roller bearings to a slightly lesser degree. Ball and roller thrust bearings do not lend themselves to operation at high speeds.

Roller bearings are capable of withstanding greater overloads and shocks than ball bearings.

Both ball and roller bearings have a hard shock reaction. Roller bearings with flexible rollers are somewhat more advantageous in this connection.

Both the starting and running friction of anti-friction bearings is less than that of the average plain bearing and ball bearings especially show a minimum frictional loss.

At low and medium speeds both ball and roller bearings show only very slight temperature increases. At high speed operation ball bearings will run comparatively cool, while roller bearings have a tendency to heat.

Anti-friction bearings, provided they are kept free from dirt and grit, will show very little wear in service. Possible adjustment for wear depends upon the type of bearing used. In the presence of dirt and grit ball and roller bearings wear rapidly. Both ball and roller bearings require very little lubricant in service, and both ball and roller bearings are highly reliable in sevice with a minimum of attention.

Anti-friction bearings generally require less space axially than plain bearings of the same load carrying capacity, and the diameter of roller bearings is generally

(*Continued on page* 38)

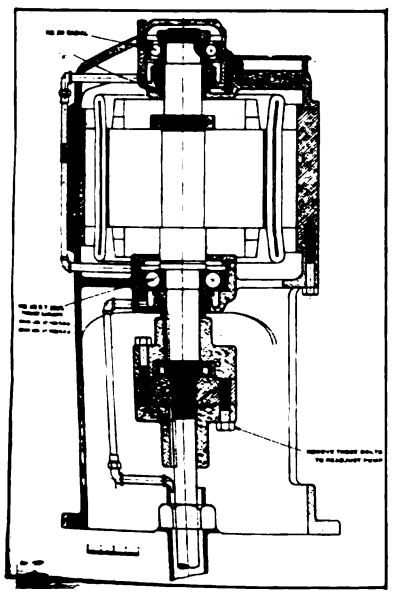


Fig. 18. Shows a cross section of a vertical motor for deep well pump heads mounted on ball bearings.

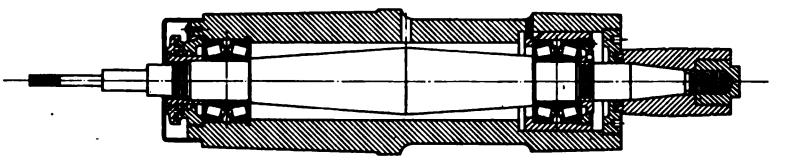


Fig. 17. Represents a high speed grinding wheel spindle mounted on taper roller bearings.

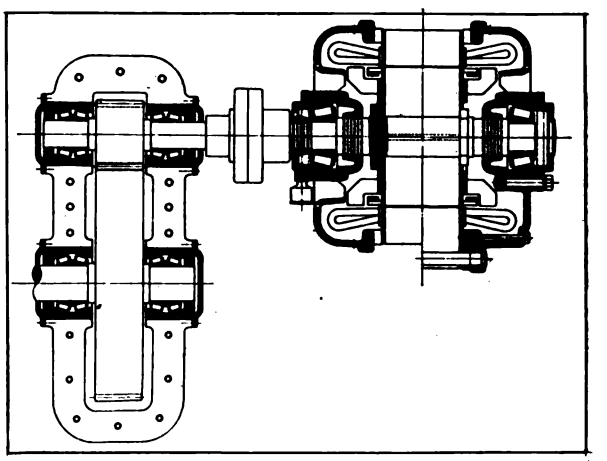


Fig. 19. Represents a sectional view of a motor coupled with a spur reduction gear unit, both mounted on taper roller bearings.

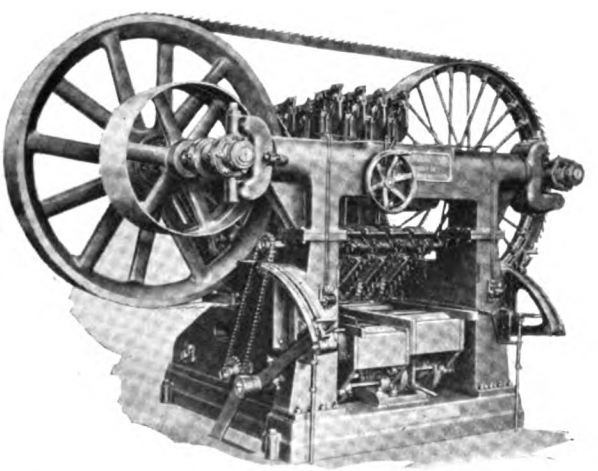
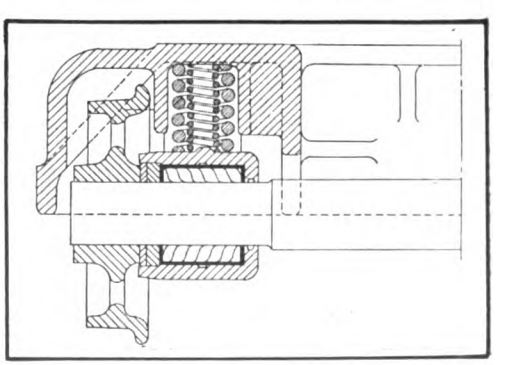


Fig. 20. View of a roller chain sprocket in a cement mill supported on two self-aligning ball bearing pillow blocks.

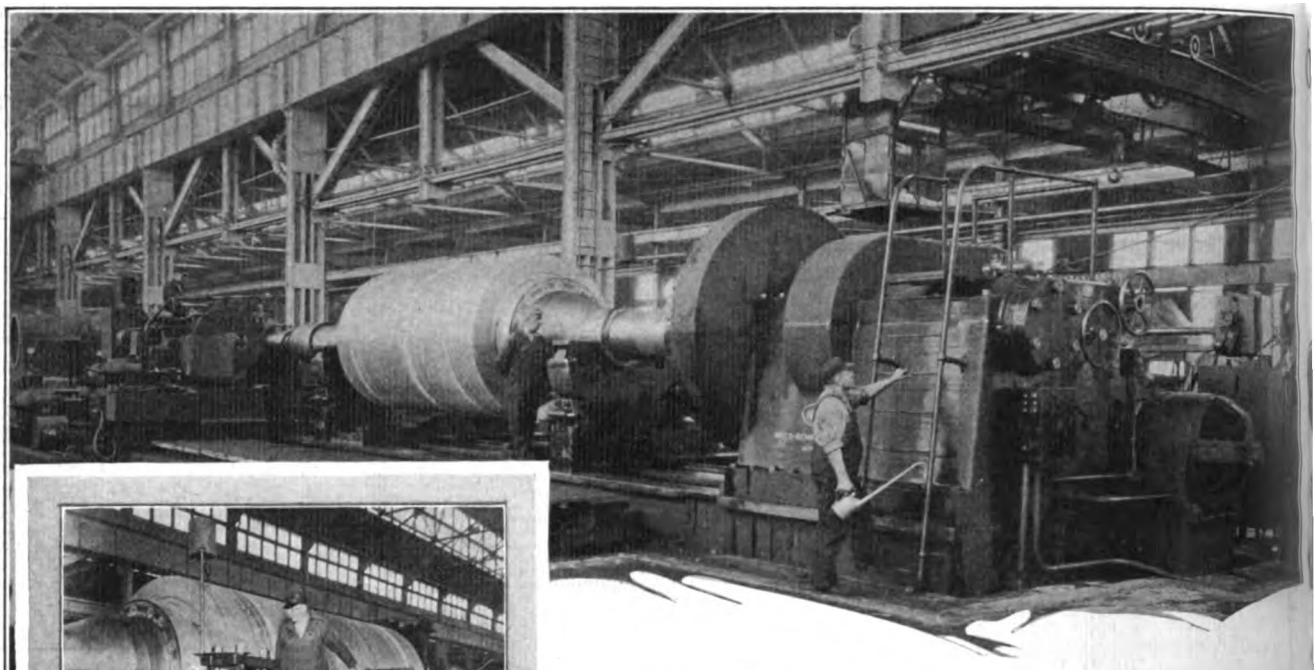


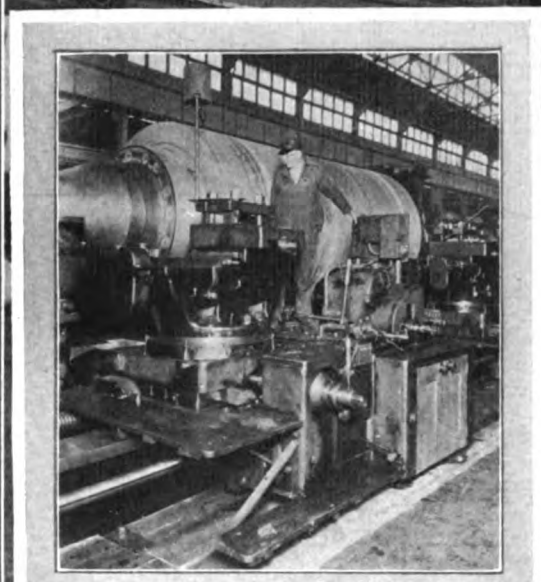
Fig. 21. Shows a horizontal re-saw used in the heavy lumber working industry. All of the principal shafts and feed-rolls are equipped with roller bearings of the self-aligning type.

Fig. 22. Sectional view of the journal box of an ingot car equipped with roller bearings.



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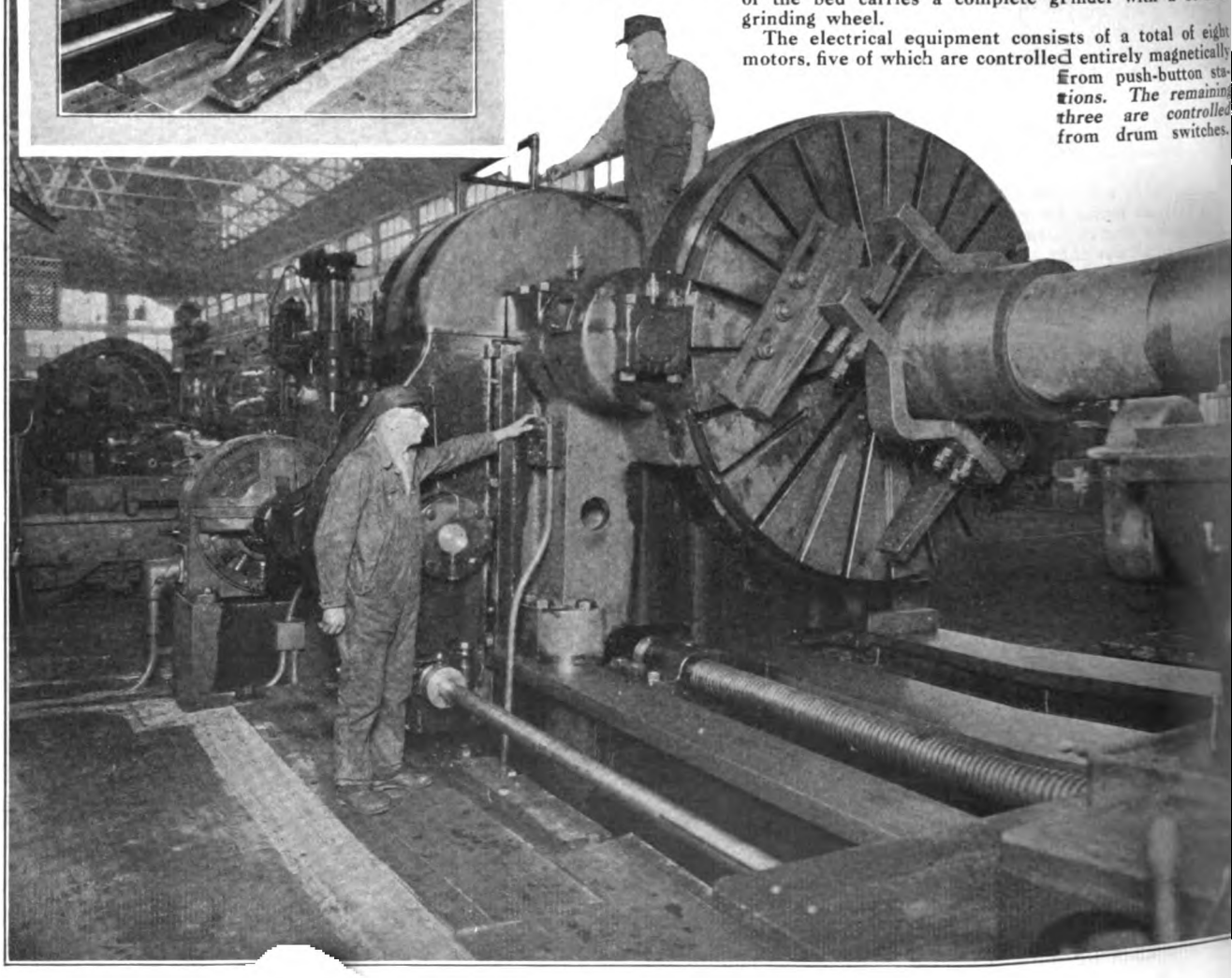




An Example of Modern Machine Tool Control

A combined lathe and grinder recently installed in one of the shops at the Schenectady plant of the General Electric Company provides an excellent example of modern, magnetic control. This machine has a 113-inch swing over the bed and 94 inches over the carriages. It will accommodate work up to 45 feet between centers and is capable of supporting a working load of 300,000 pounds. On one side of the bed are two tool carriages each with cross sides and with compound and swivel tool rests. The other side of the bed carries a complete grinder with a 36-inch grinding wheel.

The electrical equipment consists of a total of eight motors, five of which are controlled entirely magnetically from push-button stations. The remaining three are controlled from drum switches.



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Unobstructed Floors Aid Production

Modern Handling Equipment Tends to Provide Free Movement

By Morgan G. Farrell



Fig. 1. Floor space to ceiling height may be used for storing rolls of paper when they are stacked with portable elevators such as this.

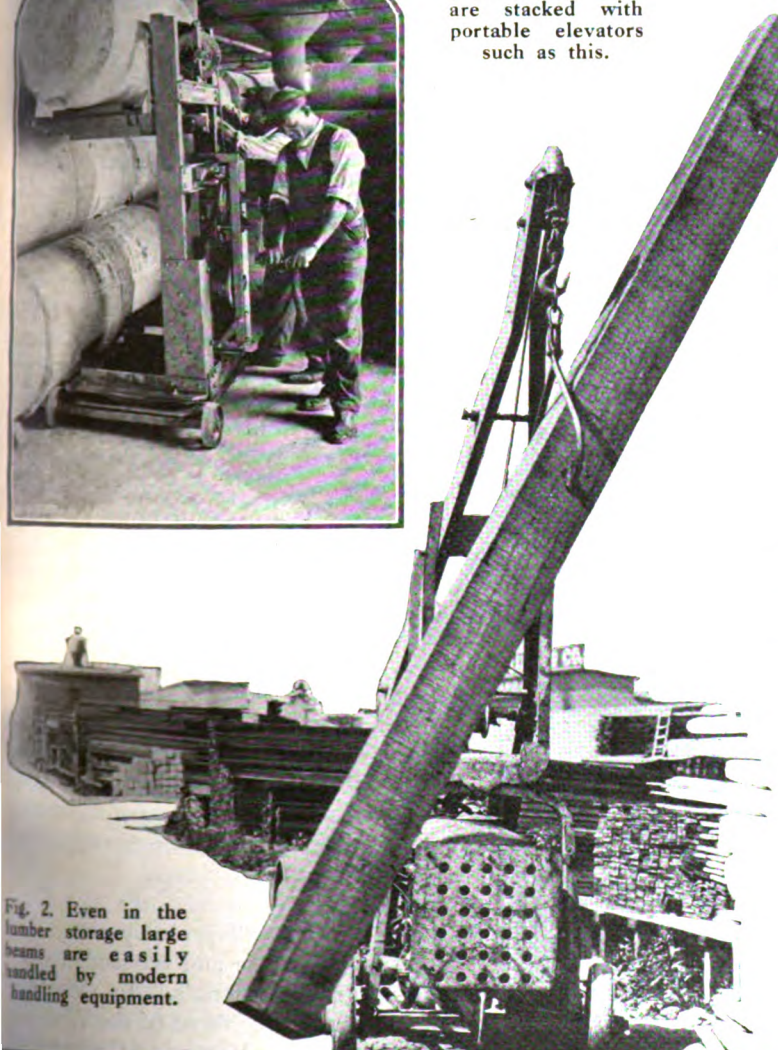


Fig. 2. Even in the lumber storage large beams are easily handled by modern handling equipment.

SO much has been said about the labor-saving effected by the use of free-moving, lifting and transporting equipment in industrial plants that a certain revolutionary change brought about by the introduction of this apparatus has hardly been stressed. This change, taken in conjunction with the introduction of the individual motor-drive, may be said to constitute complete emancipation from slavery to belts and rails.

The handling and transportation of goods through a manufacturing establishment may be analyzed as:

1. A horizontal movement at grade,
2. A horizontal movement overhead,
3. Vertical short movements,
4. Vertical long movements,
5. A combination pick-up-and-carry movement.

Not much more than fifteen years ago, the only recognized device for moving goods through a plant, in a horizontal direction at grade, was the hand truck and the industrial railway whose cars were also operated by hand. It is hardly necessary to dwell upon the limitations of either form. The goods, whatever their nature, were picked up by hand and loaded on the car, whether the latter was mounted on tracks or not. Upon arriving at its destination, the goods were again dumped from the platform to the floor.

In addition to this back-breaking feature, the industrial railway had other draw-backs. Unless a long radius curve was used, the friction of the wheels against the rails made it necessary to have additional push-power to get around the curves. If turn-tables were



Fig. 3. Another example of modern materials handling equipment in the lumber industry.



Fig. 4. To save floor space in this plant drums of oil are stored in racks to ceiling height.



Fig. 5. Foundries make good use of modern materials handling equipment for transporting flasks.

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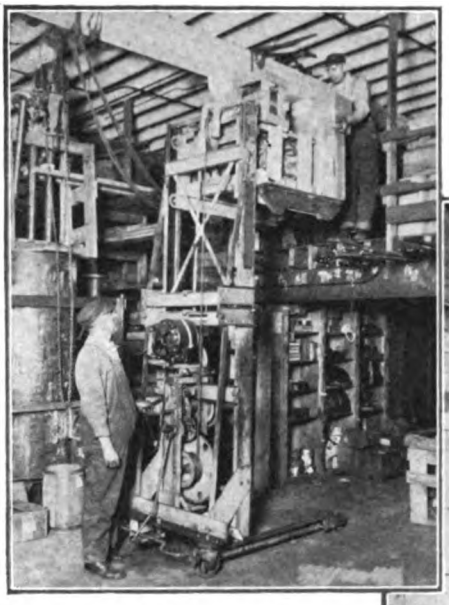
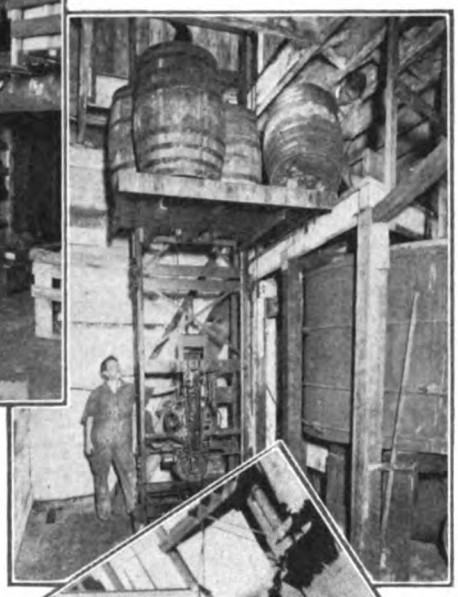


Fig. 6. Storing materials on balcony floors is easy when portable elevators are used.

Fig. 7. Elevating barrels to be emptied into the vat shown at the right, below.



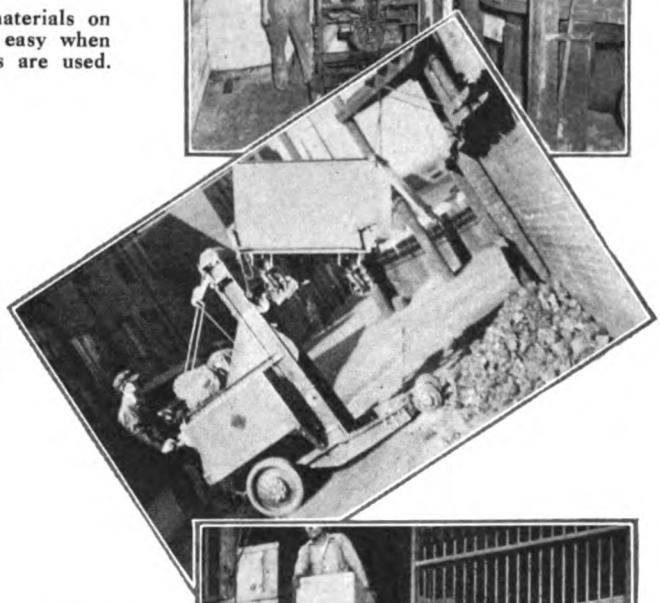


Fig. 8. All manner of equipment such as this dump truck can be handled by these electric trucks.

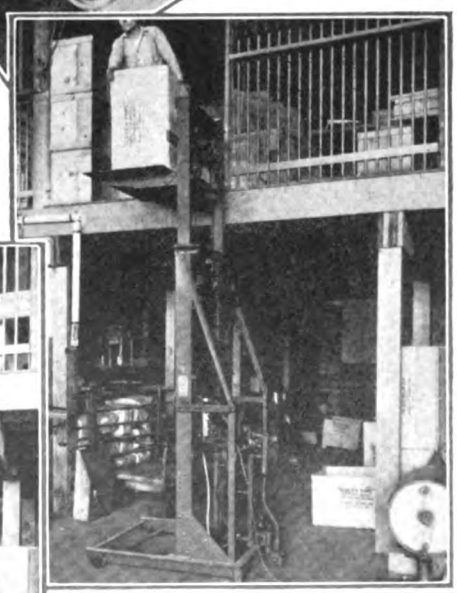


Fig. 9. Another example of the use of portable elevators for handling materials to balcony floors.

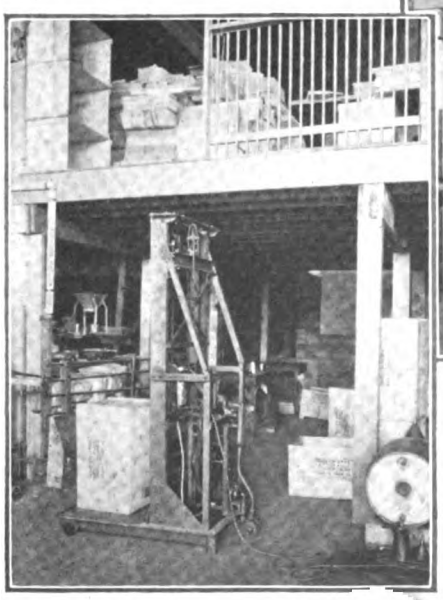


Fig. 10. This illustration shows the ease with which boxes may be placed on the platform of portable elevators.



Fig. 11. An electric tractor hauling train of loaded dump cars.

used, they could accommodate but one car at a time, thereby slowing down the process of changing direction, in the case of a train of cars. Finally, the nature of the system made it necessary to run the track in a straight line, so that it is remote from many of the machines, it was intended to serve.

The horizontal overhead transportation of goods was limited largely to monorails and travelling cranes. (Telpherage systems do not interest us in this connection, nor do we include continuous conveyor systems.) The advantage of the monorail over the industrial track is that the floor is free from rails. It need not even be paved. For instance, it is at its best in a foundry where there is no pavement on the floors at all, or in transportation between buildings. On the other hand, its limitation is about the same as that of the industrial railway. Moreover, it requires some special supporting structure, ether fastened to or independent of the building structure.

In some industries, the travelling crane is and will probably always be the most suitable and economical way of handling materials. In shops of great length, like those of the Western Electric & Manufacturing Company at East Pittsburgh, the process of manufacture proceeds in a straight line from



Fig. 18. A special trailer for handling rolls of electric cable.

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12. Still another type of cart or uck that electric tractors handle.

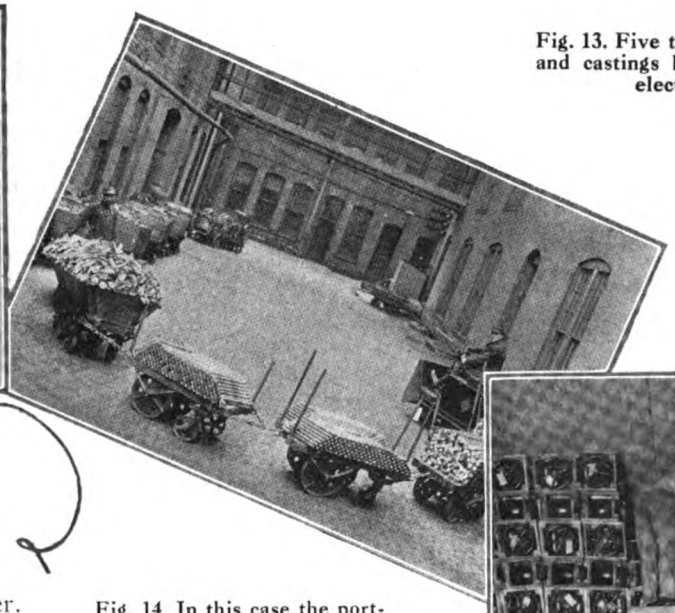


Fig. 13. Five truck loads of forgings and castings being pulled with an electric tractor.

one end of the building to the other. The product grows as it passes along, and the high-speed overhead cranes in one or more banks are almost the only possible means of lifting and carrying.

For the plant of moderate size, however, the first cost of a travelling crane, its run-ways, and supporting structure is large. If the crane is to be of any great use, its run-way travel, bridge travel, and lift should all be electrical. It is unsatisfactory to use hand power for one or more of these, since it slows down the whole process. And, as even the small shop has a span of sixty feet, it is evident that the crane is a rather expensive form of equipment, in this instance.

If jib-cranes are used for lifting, their service area is naturaly limited to the arc described by their radius. Fixed hoists are the most limited of all lifting apparatus, since their effectiveness is limited to a single vertical line.

The New Way

The industrial railway still has important applications, principally under conditions which require a miniature railroad transportation system. In plants, however, which are devoted to manufacturing processes, carried on in paved, glass-enclosed structures, the electric tractor with its train of trailers, has proven to be rapid, adaptable, and



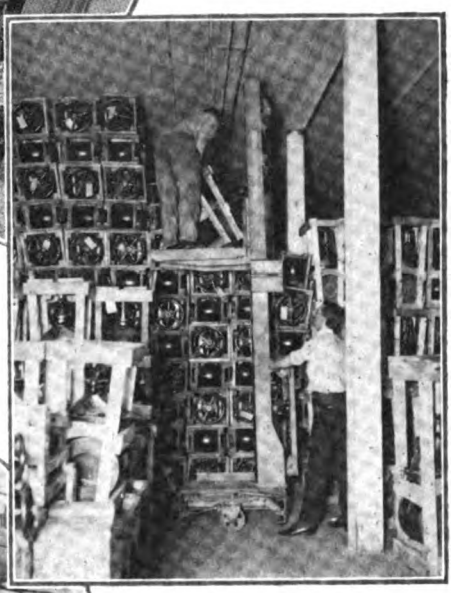


Fig. 14. In this case the portable elevator makes it possible to utilize every available inch of floor space. (Right)



Fig. 15. For handling such containers as these the hand lift truck is an aid. (Left)

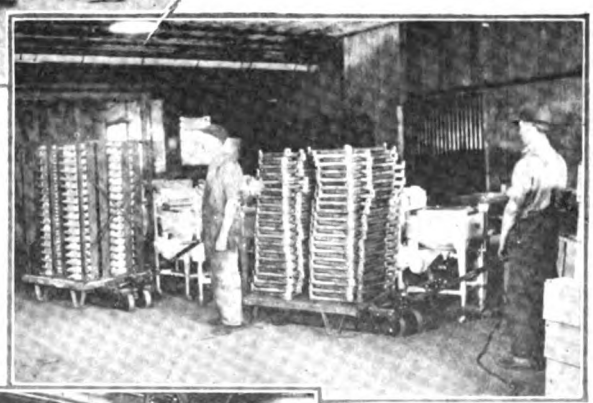


Fig. 16. In this plant washing machine parts are piled on skids which are hauled by hand lift trucks. (Right)



Fig. 17. Another example of the use of hand lift trucks for transporting containers equipped with skids.

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flexible for horizontal transportation at grade. In plants of this class, devoted to the manufacture of such commodities as small metal parts, mechanical equipment and wooden ware, there is little occasion for overhead transportation systems. The storage battery tractor is therefore all that need be considered for interior transportation. Gasoline tractors are best suited for use in the yard.

The electric tractor is made in a great variety of forms, for as many different classes of use. It may be simply a storage battery locomotive for hauling trains. These are so designed that their turning diameter is less than that of an industrial railway. They are also made with a four-wheel, steering arrangement, in which case they can turn in twice their own length.

Some manufacturers make a tractor with a power lift-platform attachment. These are particularly useful in plants in which both heavy and bulky products are to be handled by the trucks, such as steel castings, bags of flour or cement, paper and box-board, and heavy machine parts.

The storage battery tractor is also made in the form of a plain platform truck, so designed that the working parts are condensed into an incredibly small space at one end of the machine, leaving the entire platform free for cargo. The operator stands on a platform in front. Finally, this form of tractor may be fitted with a motor-operated crane. This form is particularly suited for handling light machinery. There are many other special forms of applying the tractors to unusual conditions, such as handling large cases of equipment, packed for shipment, large rolls of paper, and stacked brick. They come pretty close to being a kind of universal handling and transportation medium.

Some other form of equipment is needed to elevate material to any height. The portable elevator was originally devised as a means of stacking bales and boxes to a greater height, thus economizing in warehouse floor space. It has, however, proven to have a great variety of applications, which vastly widens its usefulness. For instance, these machines have been used at points where there was a difference of a few feet between the levels of the floors of two buildings, to displace a ramp. They have also been used as an ordinary elevator would be, to serve mezzanine floors. They have the advantage of mobility over a permanent elevator. In conjunction with their team-mates, hand lift trucks solve the problem of elevating and stacking from the floor.

In fact, by the use of various combinations of the apparatus described, horizontal and vertical transportation attains one hundred per cent. flexibility. All the processing machines in the plant, as well as the intermediate and final storage spaces are made directly accessible so that rehandling is practically eliminated. If the nature of the goods manufactured is such that the proc-

(*Continued on page* 40)



Fig. 19. An automobile being towed up a ramp in a modern garage with an electric tractor.

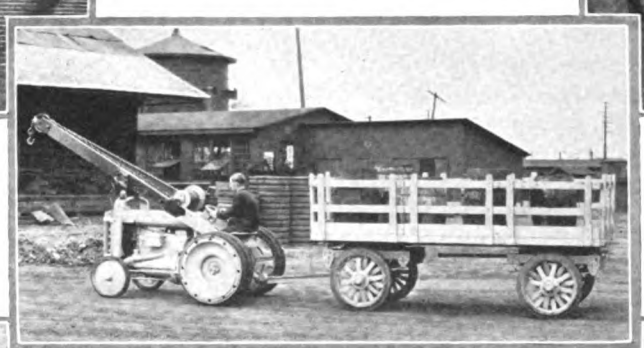


Fig. 21. This tractor, fitted with a crane is also capable of handling a large size automobile trailer.



Fig. 20. Handling cartons containing automobile spring bumpers with a hand lift truck.



Fig. 22. Railroad companies also make use of electric tractors for handling express and baggage.



Fig. 23. A permanent installation of a portable elevator for handling four-wheel push trucks.

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Standardizing Specifications on $42,000 Worth of Power Belting

By William Staniar

"INCREASED Cost to the Consumer" is not the language of Oakland or in fact any division of the General Motors Corporation, therefore managerial eyes are always on the lookout for cost reducing opportunities. For many years power belting had escaped the scrutiny of Oakland executives due, no doubt, to the fact that their minds were necessarily focused on the really big things of management and the mechanical operating details were left to the plant men. However, it is the multiplicity of small plant operating losses that finally causes executive investigation.

This state of affairs did not harmonize with Oakland efficiency and immediate steps were taken to stop this unseen but steady waste of mechanical energy because it presented another opportunity for operating cost reduction. It is this new over-all efficiency thinking of executives that has made possible the remarkable achievements of the automobile industry during the past few years. Everything must coordinate, and belting is now considered power and not merely strips of material connecting one pulley with another.

Oakland knew that within its own organization there was no one with sufficient belting experience to standardize its drives and therefore sought the coöperation of the du Pont Engineering Company—a subsidiary of the du Pont Company—in this phase of its operations because it knew of the

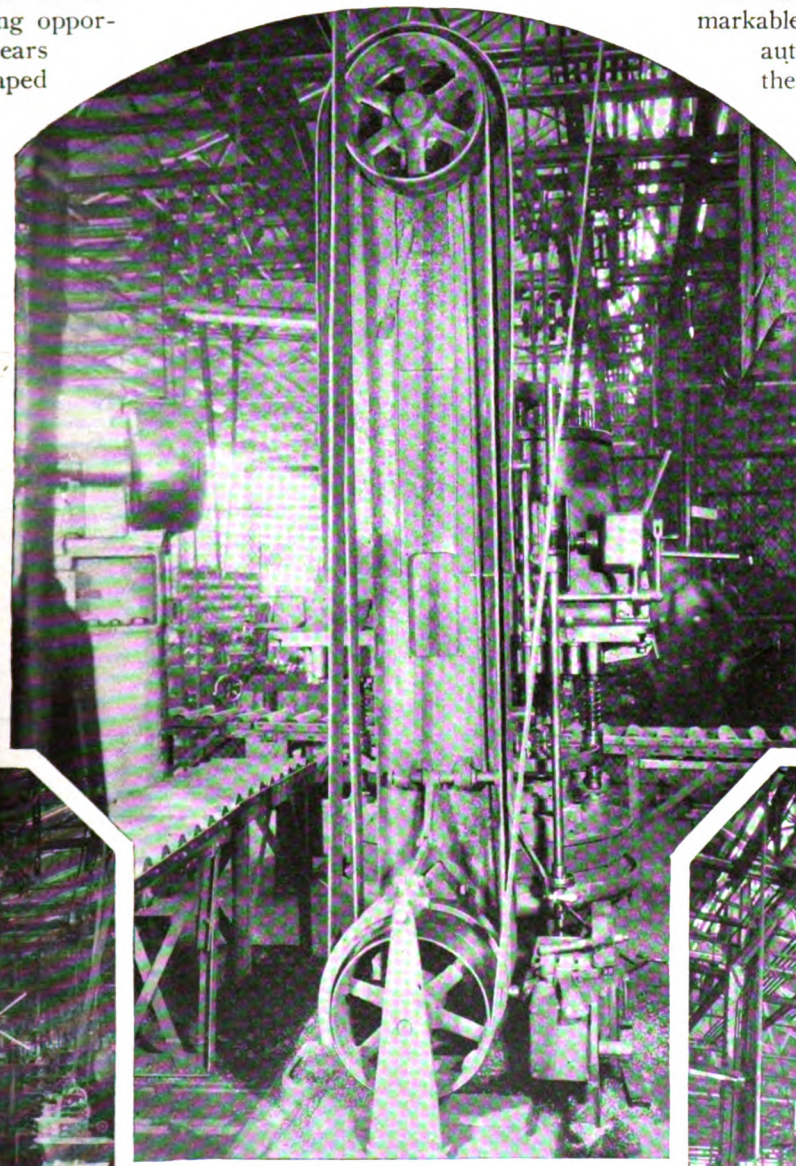


Fig. 1. A line Shaft Belt-Connected Heavy Duty Multiple Drilling Machine. An installation of this nature demands a belt with a high coefficient of friction, low stretch and transverse resistance to frequent shifting, otherwise belt life is short, maintenance high and production suffers.



Fig. 2. A Direct 15-HP Belt Connected Multiple Drilling Machine. Belt drive is vertical with heavy load and no means for take-up is provided, therefore, stretch is a production and maintenance factor. Belting for this installation should possess the quality of low stretch.

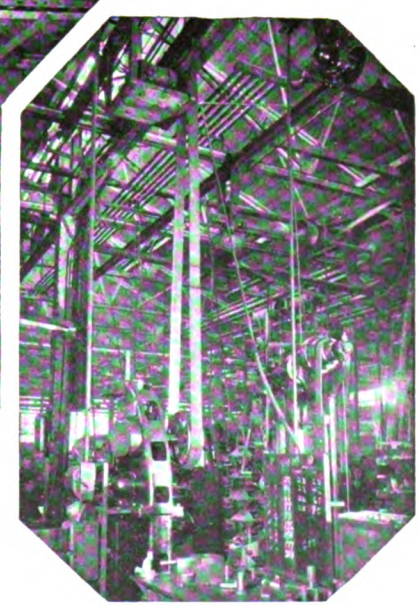


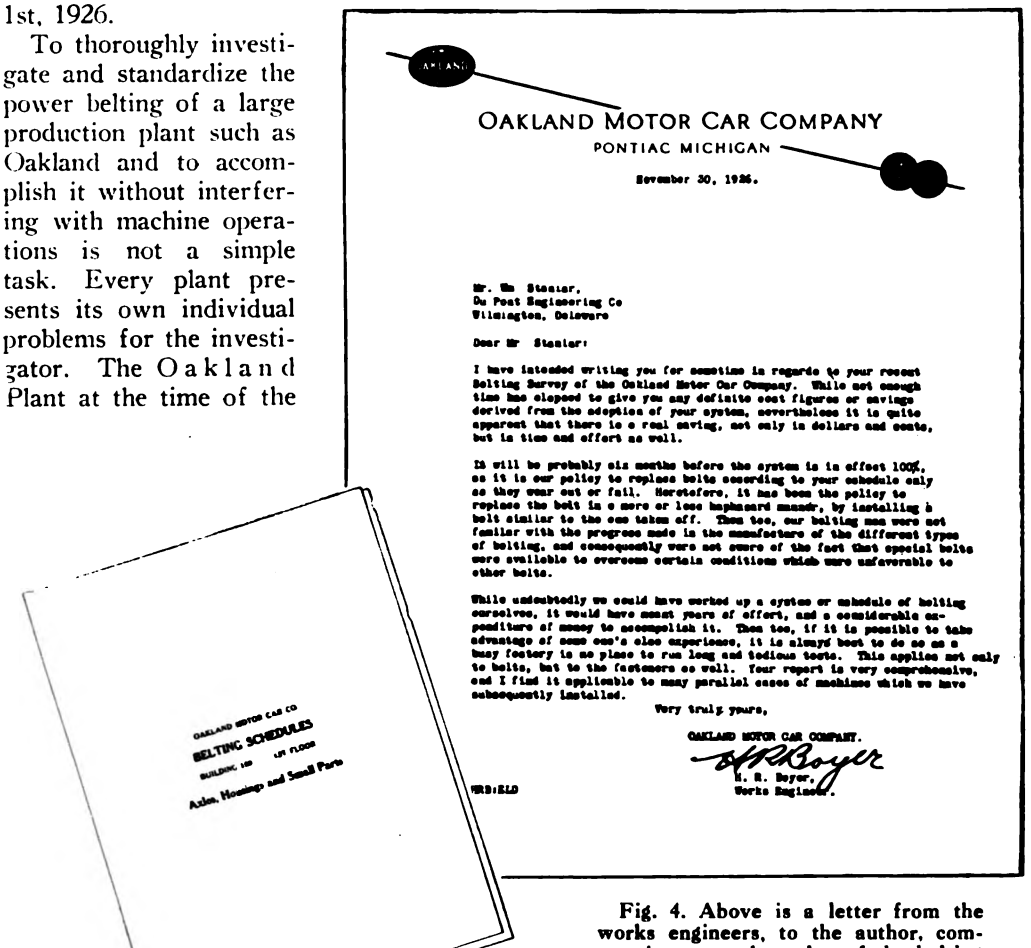
Fig. 3. A Direct 5-HP Belt Connected Single Spindle Drilling Machine. A belt with a high coefficient of friction, low stretch and extreme flexibility is required for this operation.

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success of the du Pont belting system in all large plants of that organization and two other units of the General Motors Corporation, viz., The Hyatt Roller Bearing Company of Newark, N. J., and the Cadillac Motor Car Company of Detroit.

The actual work of analyzing and standardizing the belting requirements of the Oakland Motor Car Company was begun by the writer for the du Pont Engineering Company on April 1st, 1926.

To thoroughly investigate and standardize the power belting of a large production plant such as Oakland and to accomplish it without interfering with machine operations is not a simple task. Every plant presents its own individual problems for the investigator. The Oakland Plant at the time of the belting survey, April, 1926, was composed of sixty-two individual departments housed in approximately fourteen buildings, most of which were adjoining. The main production belt driven machine operations occur in one great floor space which is known as the Motor Manufacture and Assembly Department. In this department there are a thousand machine tools and over three thousand individual belt drives comprising a total of approximately eight miles of power belting of various sizes and kinds, having a valuation of about forty-two thousand dollars.


OAKLAND MOTOR CAR COMPANY

PONTIAC MICHIGAN

November 30, 1926.

Mr. Wm Stenzler,
Du Pont Engineering Co
Wilmington, Delaware

Dear Mr Stenzler:

I have intended writing you for sometime in regards to your recent Belting Survey of the Oakland Motor Car Company. While not enough time has elapsed to give you any definite cost figures or savings derived from the adoption of your system, nevertheless it is quite apparent that there is a real saving, not only in dollars and cents, but in time and effort as well.

It will be probably six months before the system is in effect 100%, as it is our policy to replace belts according to your schedule only as they wear out or fail. Heretofore, it has been the policy to replace the belt in a more or less haphazard manner, by installing a belt similar to the one taken off. Then too, our belting men were not familar with the progress made in the manufacture of the different types of belting, and consequently were not aware of the fact that special belts were available to overcome certain conditions which were unfavorable to other belts.

While undoubtedly we could have worked up a system or schedule of belting ourselves, it would have meant years of effort, and a considerable expenditure of money to accomplish it. Then too, if it is possible to take advantage of some one's else experience, it is always best to do so as a busy factory is no place to run long and tedious tests. This applies not only to belts, but to the fasteners as well. Your report is very comprehensive, and I find it applicable to many parallel cases of machines which we have subsequently installed.

Very truly yours,

OAKLAND MOTOR CAR COMPANY.

H. H. Boyer,
Works Engineer.

WHB:ELD

OAKLAND MOTOR CAR CO

BELTING SCHEDULES

BUILDING NO 1ST FLOOR

Axles, Housings and Small Parts

Fig. 4. Above is a letter from the works engineers, to the author, commenting upon the value of the belting survey. At the left, in miniature, is a reproduction of one of the departmental folders of belting specifications.

The chief object of the du Pont belting analysis system is to place the right type and right size of belting in the right place and to prevent the use of different types and sizes on exactly similar machine drives. The investigator must study each and every belting installation from a mechanical and operating standpoint, and it must be done without hindrance to plant operations. However, before beginning the actual detail study of each and every drive, there are a number of important factors that must be considered.

1. The types of belting in operation
2. Selection of type
3. Determination of size and type for each installation
4. Stock belting storing method

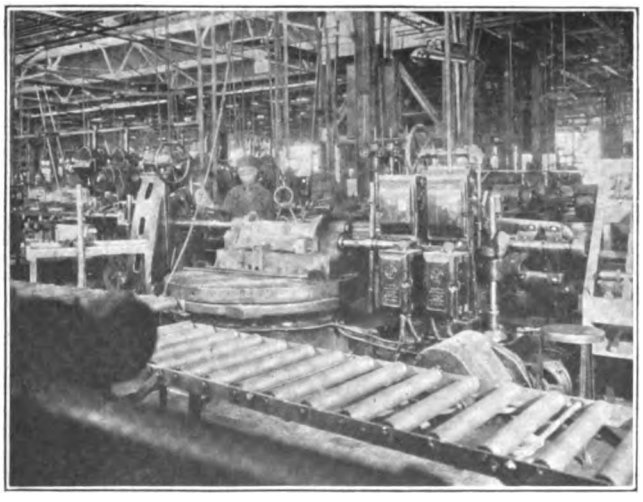


Fig. 5. The machine in the middle foreground is reaming crankshaft and camshaft bearings in the cylinder block.

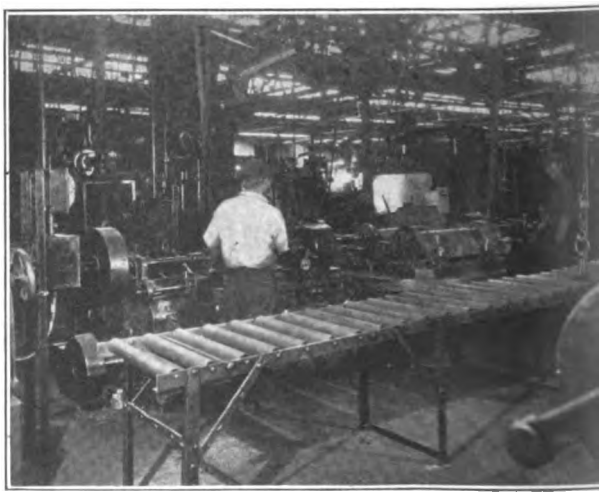


Fig. 6. Just back of the roller conveyor unit, the operator is rough boring cylinder blocks for crankshaft and camshaft bearings.

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Fig. 7. A Direct 15-HP Belt Connected Heavy Duty Multiple Duty Drilling Machine. Belt drive is vertical and pulley on motor is small diameter at high speed. A non-flexible belt here causes high maintenance and production loss, chiefly due to slip. Belting of high frictional value and flexibility should be employed for installations of this character.

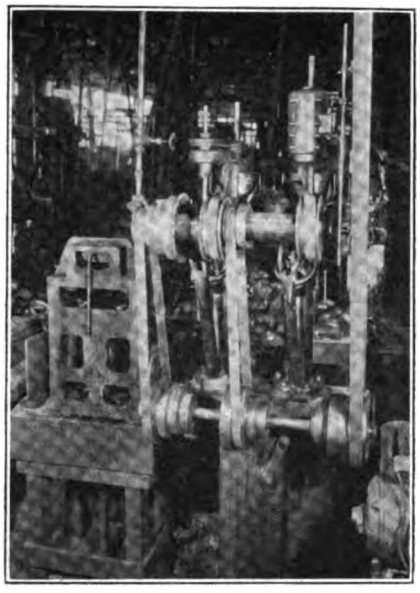


Fig. 8. A Line Shaft Belt Connected 2-Spindle Drilling Machine. A very troublesome belting installation unless the correct type and size are employed. Note the horizontal quarter-turn flanged pulley drives. A flexible belt is imperative here.

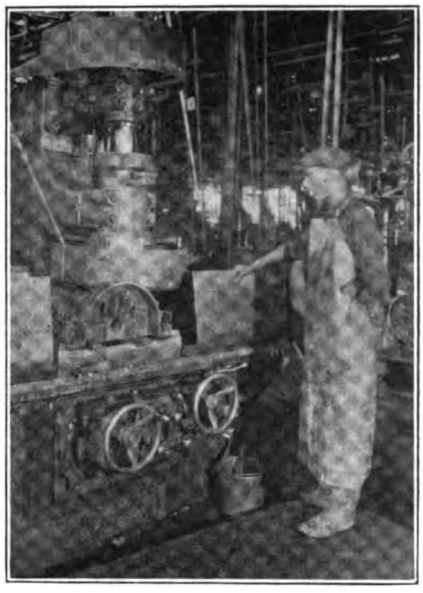


Fig. 9. Grinding the top surface of crankcase. Note the belt drives visible in the background; each with its particular requirements.

5. Plant belting distribution.
6. Operating belting inspection.
7. Lubrication or dressing of belting.
8. Belt fastening or joining.
9. Piece or time wage of operators.
10. Belting repair by machine operators.
11. Number of belt maintenance men.
12. Number of belt repair shops in plant.

These factors of belting control are pertinent to most manufacturing plants and the Oakland Motor Car Company was not an exception.

The preliminary investigations at Oakland revealed that regular oak tanned leather was in general use on all high speed small pulley work, all complicated mule pulley installations and all wet grinding operations, because the possibility of obtaining more suitable tannages of leather and other types of belting for these operations had not been considered.

OAKLAND MOTOR CAR COMPANY
PONTIAC, MICHIGAN

AXLES, HOUSINGS AND SMALL PARTS
Building 109 - 1st Floor

UNIT	PRESENT BELT	TYPE RECOM.	SIZE	FASTENER
	LELAND & GIFFORD S.S. DRILL DS-180			
1-hp.Motor to Drill	1½"Sin.Lea	Special Tannage Leather	1½"Sin	#3 Clip
	ROCKFORD MILLER - RM-62			
3-hp.Motor to Counter	2" Dou.Lea.	Special Tannage Leather	2½"Sin.	Endless
Counter to Miller	2" Dou.Lea.	Leather	4½"Lt.Dou.	#4 Clip
	FOX PRESS - FX-11			
2-hp.Motor to Press	2½"Hvy.Dou.	Special Tannage Leather	4"Lt.Dou.	#3 Clip
	LELAND & GIFFORD 2-SPINDLE DRILL DG-82			
2-hp.Motor to Counter	2½"Sin.Lea	Special Tannage Leather	2" Sin	#3 Clip
Counter to Machine	2½"Sin.Lea.	Leather	1½"Lt.Dou.	#4 Clip
	LATHE AND GRINDER LINE			
15-hp.Motor to Line	4" Hvy.Dou.	Special Tannage Leather	6" Dou	Endless
	REED LATHE - LE-33			
Line to Counter	3½" 4-ply Rub.	Leather	2½"Lt.Dou.	Endless
Counter to Machine	2" Lt.Dou.	Leather	2" Lt.Dou.	R.N.Lace
	BLOUNT GRINDER - GR-33			
Line to Counter	3" Dou.Lea.	Leather	3" Lt.Dou.	#4 Clip
Counter to Grinder	3½"Dou.Lea.	Special Tannage Leather	3" Lt.Dou.	#4 Clip



Fig. 10. At the right, a reproduction of the book of belt specifications resulting from the survey; above, a typical sheet from this book.

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For certain applications, regular oak tanned leather is unsuitable and uneconomical. In some cases, other tannages should be used; in others, rubber belting, fabric, or composition belting will give the best results. Each drive must be studied, together with its surrounding operating conditions, to determine the best type of belt for its particular needs.

The storing of stock power belting is an important factor and exerts an influence on the respect shown belting by the plant maintenance men. If it is stored haphazardly along with other mechanical goods such as packings, pipe fittings, pulleys, shafting, etc., it is not considered of any more importance. Belting is the link between power and production and deserves to be stored individually and systematically. At Oakland before the investigation, belting was simply strips of material and stored as such along with other mechanical materials.

The belting of a plant usually suffers from lack of regular and systematic inspection. It is not considered in a class with other necessary systems of a plant such as electric power lines, heating systems, costly automatic machinery or water lines which receive rigid inspection at regular intervals, yet it is just as important to plant operation as any of the items mentioned. Belting, like all other operating mechanisms, needs attention if it is to deliver full value to the driven pulley and no type of this transmission medium or any standardization system of belting will return full value unless a regular inspection system is incorporated in the program of better belting.

Prior to the analysis, one of the causes of premature belting failure at Oakland was the lack of systematic inspection. Belting, and particularly leather belting, requires food and food of the right kind. The life of machinery would be extremely short with-

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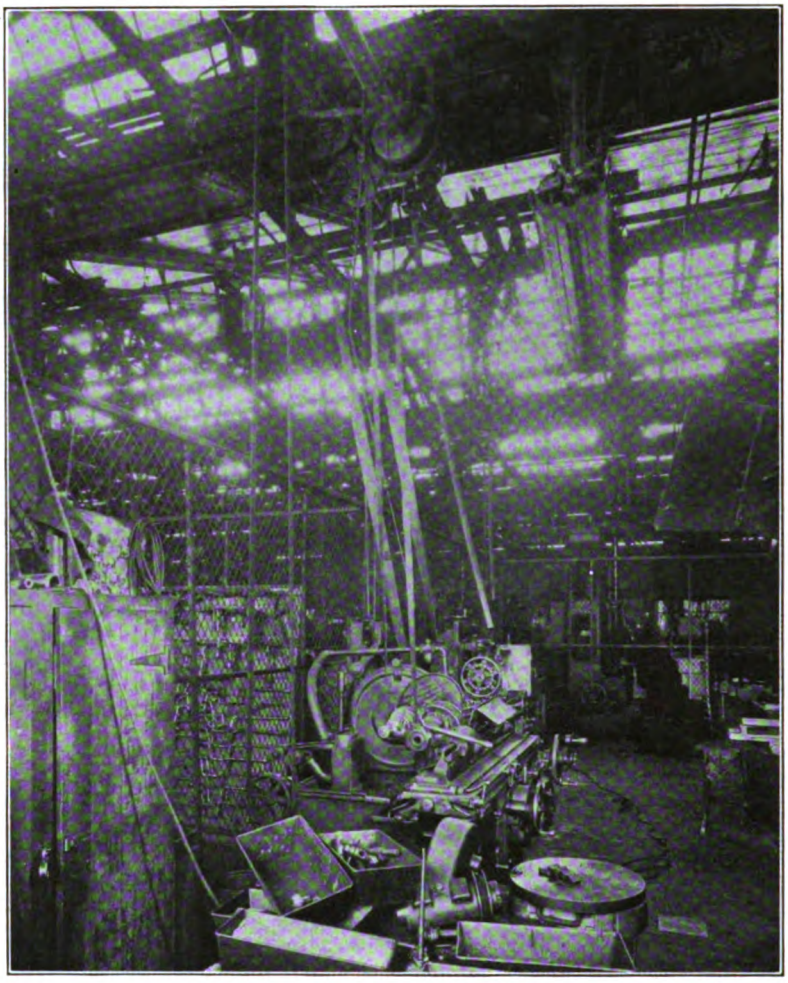


Fig. 11. A Line Shaft Driven Grinding Machine. A machine of this character employs a number of belt drives; the most important and most troublesome one being the grinding spindle belt, which operates at high speed over small diameter flanged pulleys and is spring idler tightened. The wrong belt here has a short life and causes imperfection in the piece being ground. This drive demands a smooth running and flexible belt and it should be endless. A metallic fastener causes a vibration known as "chatter" which is injurious to the piece being ground.

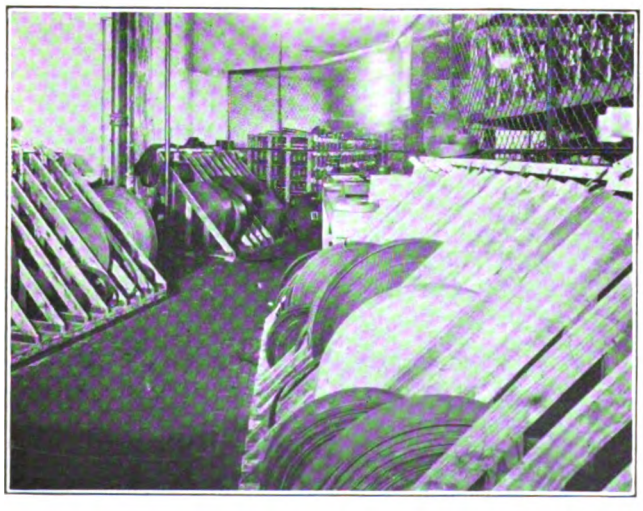


Fig. 12. Belting, at the Oakland plant, is now power transmission and is stored and classed as such. Before standardization it was just mechanical goods and stored along with other plant [illegible]s.

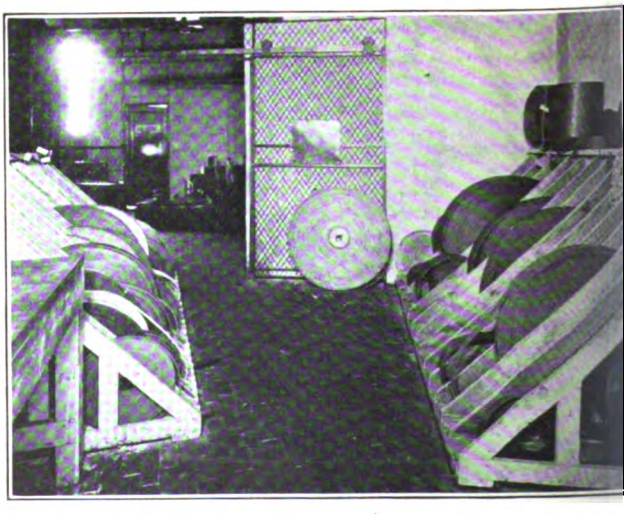


Fig. 13. Another view of the belt storage department. This, and Fig. 12, present a decided contrast to the usual practice in industrial plants.

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Good Lighting in Various Branches of Industry

By H. J. Littlefield

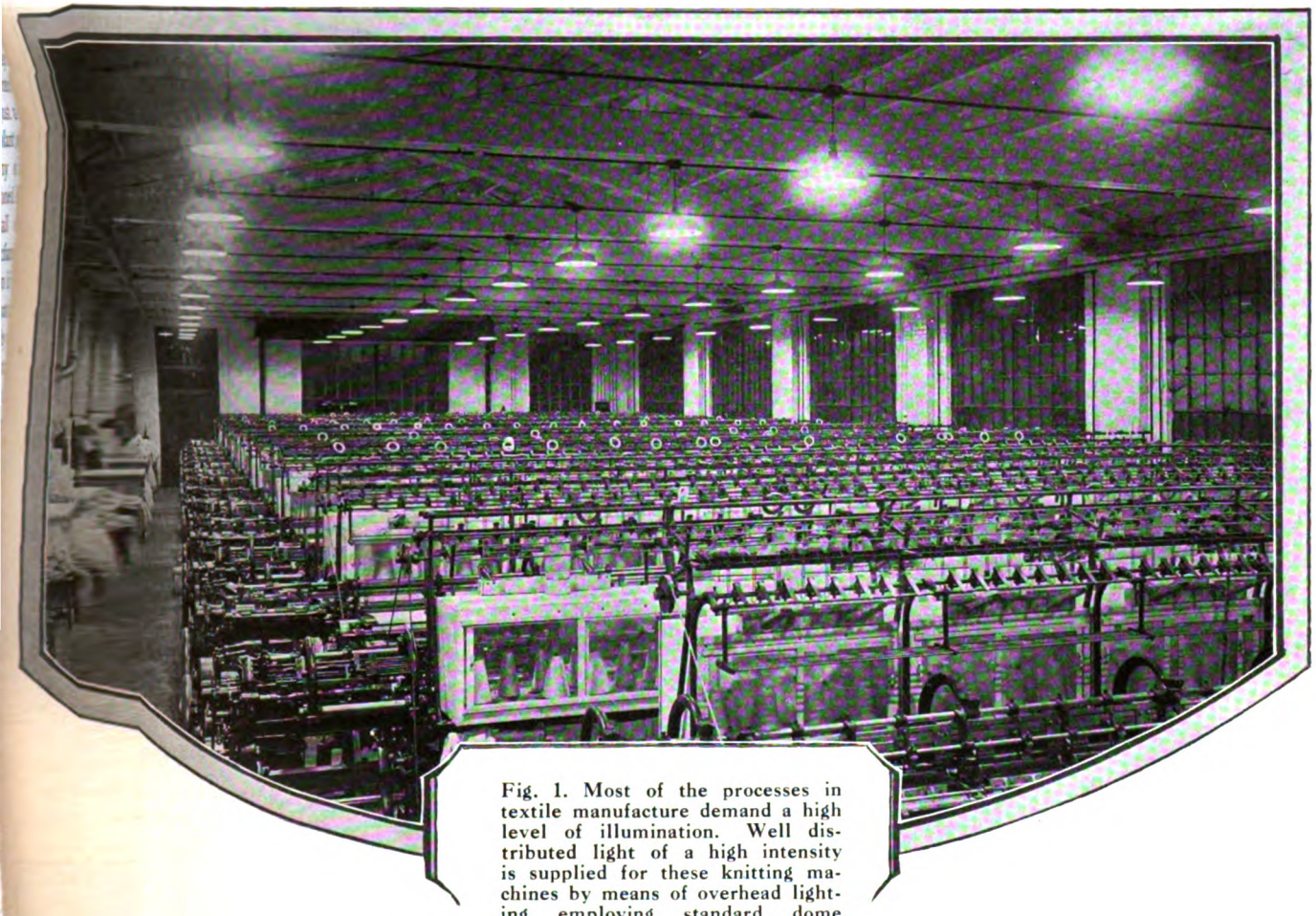


Fig. 1. Most of the processes in textile manufacture demand a high level of illumination. Well distributed light of a high intensity is supplied for these knitting machines by means of overhead lighting employing standard dome reflectors.

IT is now coming to be realized more and more the part that light plays in modern industry, not only as a measure for safety but as a means to increased production. During the past year tests conducted in a score of plants representing many diversified industries have shown an average increase of 14 per cent. in production attributable to the installation of improved lighting. Lighting is at last beginning to be seen in its true aspect, as an investment and not an expense.

As the value of lighting begins to make its impression upon many new manufacturers who have made no special investigation of the subject there is danger that they may think of good lighting as a thing which may be obtained merely by the use of higher wattage lamps. This is, of course, not true. A system of illumination must be designed to meet the conditions of the surroundings and the work to be lighted. How the specific lighting demands of various types of industrial processes may be met will be shown in later presentations of the same subject in INDUSTRY ILLUSTRATED. The pictures included herewith, which are used through the courtesy of various manufacturers of standard lighting equipment and lamps, are illustrations of good lighting as applied to various forms of industry.



Fig. 2. The light-colored ceiling and walls and the white goods make conditions ideal for the use of an indirect lighting system in this machine sewing room in a shirt manufacturing plant.

Conditions in a textile mill and in, for example, a large machine assembly plant, or again, a foundry, are radically different; but, in each case, the essential requirement is the same—*good* lighting.

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Fig. 3. Machine shops are difficult to light because the work demands high level illumination on vertical as well as horizontal planes. Good illumination is provided here by means of overhead units employing standard dome reflectors.



Fig. 4. The illumination in this well-lighted machine shop is furnished from 200 watt lamps in glassteel diffusers.



Fig. 5. For buildings with very high ceilings such as this foundry, high wattage lamps in deep bowl units provide satisfactory illumination, when supplemented by additional lighting units in the side bays.

Fig. 6. Several rows of overhead units employing high wattage lamps in deep bowl reflectors are used to light this railroad machine and erecting shop.



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Fig. 7. Locomotive erecting work demands light on vertical as well as horizontal surfaces. This photograph of the same shop shown in Fig. 6 illustrates the use of angle type reflectors mounted along the side walls to provide this additional high intensity of light on the vertical plane.



Fig. 8. The required high level of illumination for this composing room in a printing plant is furnished from a general system of overhead lighting employing glassteel diffusers.

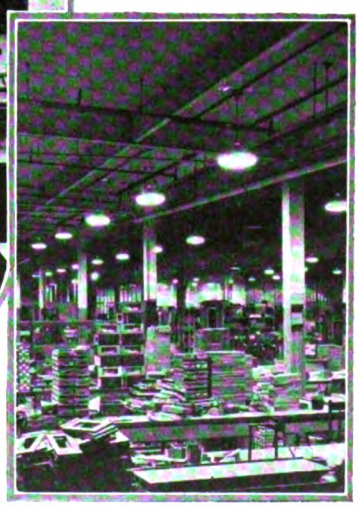


Fig. 9. The advantage of good illumination to the wood working industries may be seen in this piano factory. The installation shown here consists of a general system of overhead lighting employing standard dome reflectors.



Fig. 10. Inspection is a type of work demanding exceptionally good lighting in order that the product may be carefully examined and small imperfections detected. This inspection and packing room is well lighted by means of glassteel diffuser units mounted overhead in a symmetrical arrangement.

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Fig. 11. An installation of glassteel diffusers as applied to the assembly department in a plant manufacturing electrical equipment.

Fig. 12. A general overhead system making use of standard dome reflectors furnishes excellent illumination for this assembly department in the manufacture of Christmas tree wiring strings. The light surroundings assist materially by reflecting a large proportion of the light.

Fig. 13. The cold storage and sales room of this packing company is the place where the retail dealers come to inspect the meat before buying. Plainly good lighting is needed upon all surfaces. This installation, in which units employing dome reflectors are mounted overhead in rows between the rows of meat, provides a high intensity even at points only a foot or two above the floor.

Fig. 14. The shipping department of a plant devoted to the manufacture of piston rings. The high level of general illumination provided from standard dome reflectors renders all obstructions clearly visible and makes it possible to pack with ease in any part of the area.

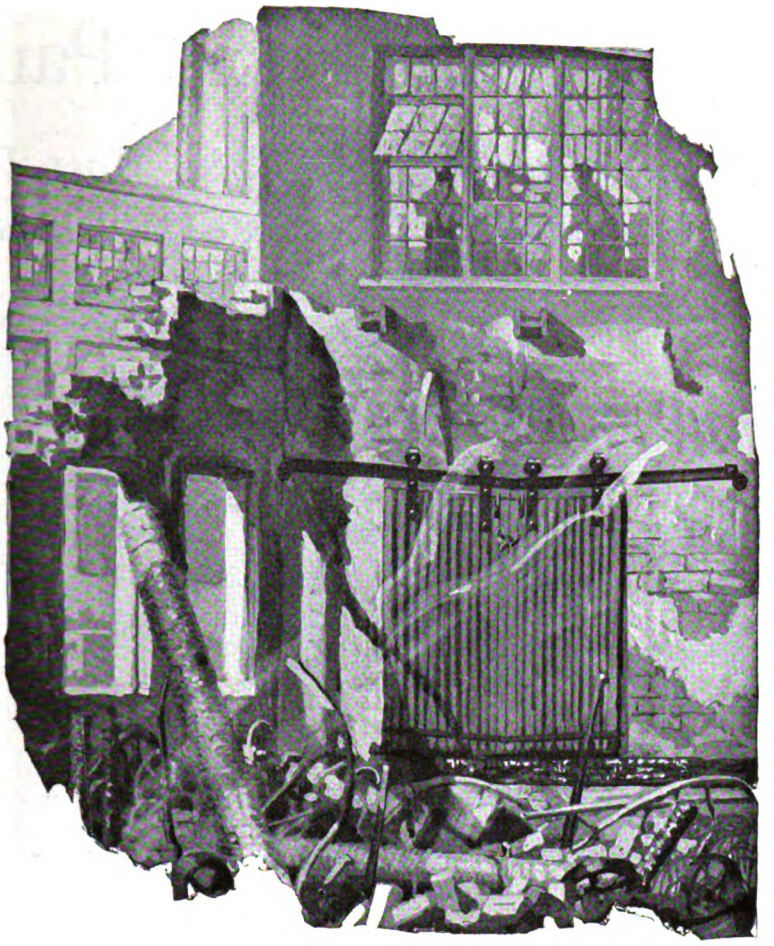


Fig. 15. A laundry well-lighted by means of glassteel diffusers. Again, notice the value of light colored surroundings in increasing the amount of effective light.





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Note the rigid construction of Fyer-doors with heavy steel frame. Yet they cost no more than tin clad doors.



R-W Fusible Links are made to fuse at any required degree of temperature. They are positive in action at all times.

A FyeR-Wall Door saved this plant!

That's because it's automatic

A saved plant is a lot better than the insurance on a burned-up plant.

FyeR-Wall Automatic Fire Doors have saved thousands of plants from fire, by keeping the fire outside; or minimizes the loss by keeping a fire confined.

FyeR-Wall Doors and automatic hardware are correctly made to *stop the passage of fire* —heavy corrugated galvanized sheets with thick sheet-asbestos between and fitted with the correct type of hardware to meet every conceivable condition.

Fye-R Wall economies are tangible and important—

—an unqualified guarantee for twenty-five years.
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What's Under the Paint?

Surface Preparation—One of the Most Important Requirements for Successful Results in Maintenance Painting

By Roy C. Sheeler

EXPERIENCE covering a number of years in analyzing reasons for unsatisfactory results in maintenance painting points to the fact that lack of proper condition of the surface at the time the painting is done is the most prolific cause for trouble later on. In spite of the vast amount of education on the part of paint and varnish manufacturers on this most important subject, there seems to be a great deal of ignorance or carelessness regarding the necessity of correct surface preparation.

It must be admitted that in certain industries, where operations must be carried on every day, there is slight chance of securing an ideal surface for painting when the work is done. In many plants, however, such is not the case. There may be no abnormal conditions to contend with, but due to lack of instruction by those responsible for results, the workmen do not put their effort into preparatory work, with the result that trouble ensues in a short time, and ruins the entire work.

Paints for the most part are combinations of oils of various types and pigments obtained from the four corners of the earth. Mixtures of this type have no affinity for water, so the first essential is to see that the surface is *dry*. Right here is one of the greatest causes for lack of satisfactory results in protective value. Manufacturing processes in many industries subject wood, metal and concrete surfaces to vast amounts of moisture. Steam vapor and condensation quickly penetrate the pores of wood or concrete surfaces and once they find lodgment there, it is very difficult if not impossible to drive the moisture out. The application of forced heat and sufficient time to thoroughly dry out the surfaces is the only way to prepare them for painting. Some plants are in operation 365 days of the year. These in particular present such problems and for the most part the means of solution are "among the missing." If the plants could shut

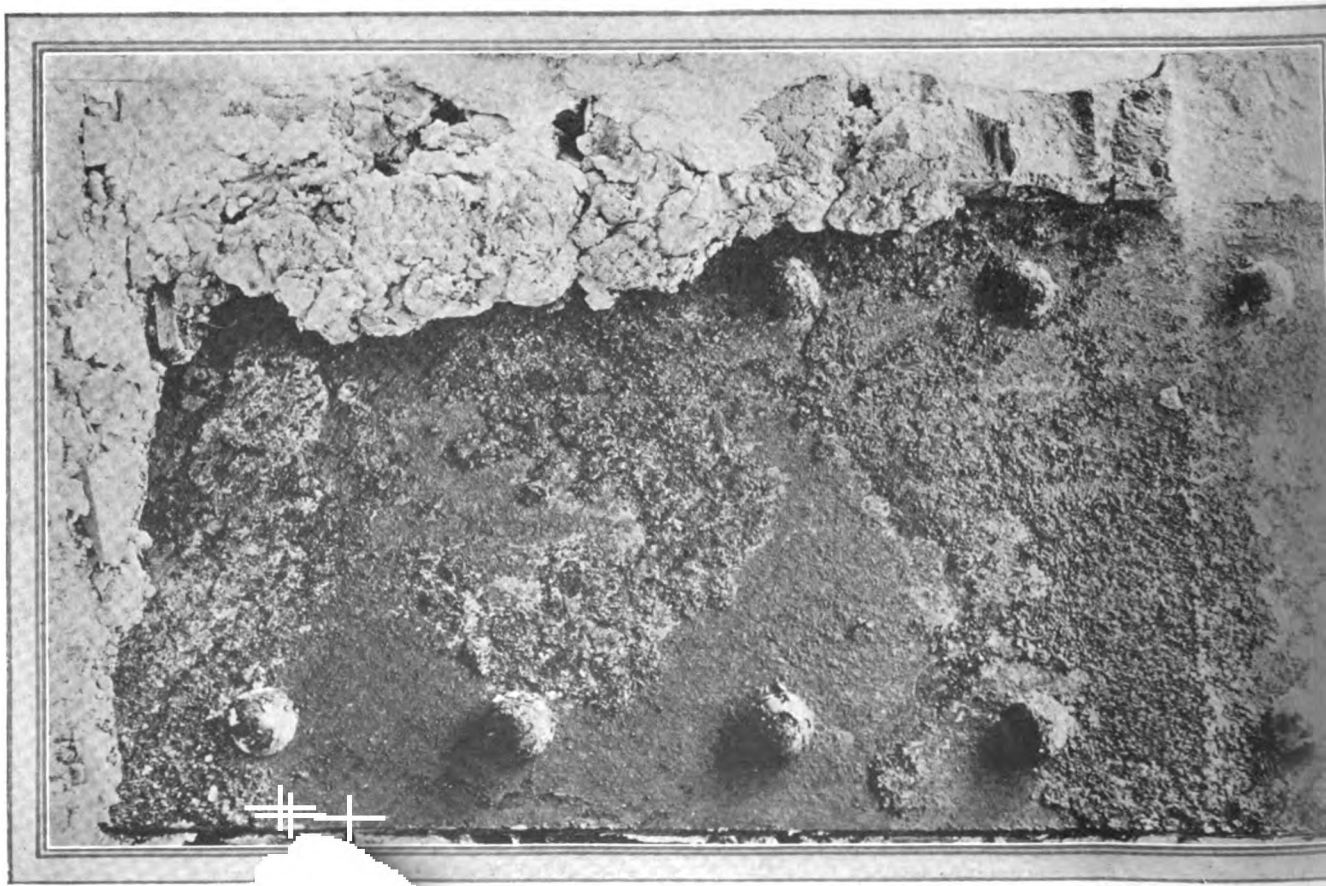


Fig. 1. A section of an iron plate, at the bottom of a door, which is badly corroded due to lack of proper attention and paint.

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down long enough and apply the means for drying out these surfaces, then reasonably satisfactory protection could be assured. Unless such means are taken, it is useless to spend the money and time to apply any paint to them. While products have been developed that will do wonderful things, there yet remains to be made a paint that can be applied over such a condition of surface with any assurance of proper adhesion and adequate protection. Some industries faced with this problem have declared a period of shut-down and have turned their entire force to the work of preparation and painting. With the use of forced heat, blow torches, etc., a partial drying-out of the surface is secured and the paint applied. This may or may not produce satisfactory results, depending upon the nature of the product and the amount of imprisoned moisture still remaining within. Finishes have been prepared that dry with a semi-porous film and which permit certain degrees of moisture to find their way through the film without taking it off. Such finishes, however, are not efficient from the protection standpoint. If they will permit imprisoned moisture to escape, they will at the same time, allow additional moisture to work its way through the film. This results in a rotting of the surface, if it is wood, and an ever-increasing rusting beneath the paint coat in the case of metal. The only benefit secured from the use of such products lies in improved appearance for the time being. From the protection standpoint the results are unsatisfactory.



Fig. 2. The siding of this building is badly deteriorated because of the lack of paint.

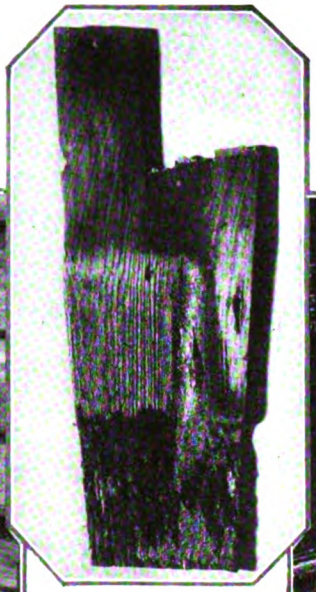


Fig. 3. The butt end of shingle worn to one-fourth of the original size caused by atmospheric conditions except exposure. This would have probably been prevented by the use of paint.

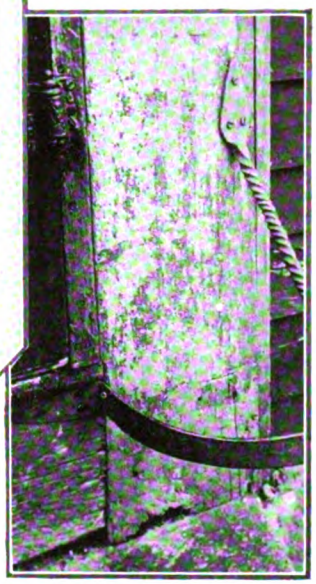


Fig. 4. Another example of deterioration because of lack of proper painting.

You may ask,—"Why is it impossible to paint over a wet or damp surface and secure satisfactory results?" The reason for this is plain. Take an unpainted wood surface, exposed to vapor or moisture for a period of time. Suppose the *surface* could be made dry enough to paint and have two or three coats applied in the usual manner. This film should present an effective barrier against the absorption of more moisture. But what of the moisture already in the wood surface? What is going to become of it? Under the influence of heat, either of the sun or from manufacturing processes, the moisture is going to try to find a way out of its prison. Tremendous pressure from within is the result. It begins to force its way toward the surface and finds there a solid wall, apparently blocking egress. The pressure from within grows stronger and stronger and finally bursts its way through, usually in the shape of blisters in the paint coat. These finally break open and allow the moisture to escape. At the same time the paint film is ruined from the protection standpoint and carries slight if any value in that direction. Thus it may be appreciated that the surface must be free from moisture for good results.



Fig. 5. Paint on the ceiling in this building is peeling off, probably due to lack of proper condition of the surface before applying the paint.

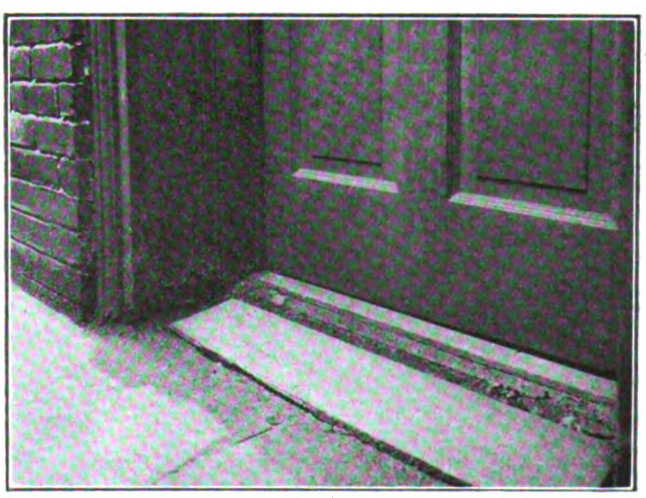


Fig. 6. The badly deteriorated door, due undoubtedly to the lack of paint.

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Preparation of Wood Surfaces for Painting

In the case of wood surfaces that are free from moisture, the preparation necessary can readily be taken care of. Naturally they should be free from dust and dirt. The presence of any foreign material on the surface will spoil the appearance of the work and may at the same time prevent the forming of a solid film, allowing moisture to penetrate. Where dirt adheres tightly to the surface, it should be scraped off and then brushed briskly with a painter's duster. All sap-streaks or knots should either be brushed with turpentine prior to painting or given a coat of thin shellac. This treatment will soften the resin in the wood and allow the priming coat to obtain adhesion.

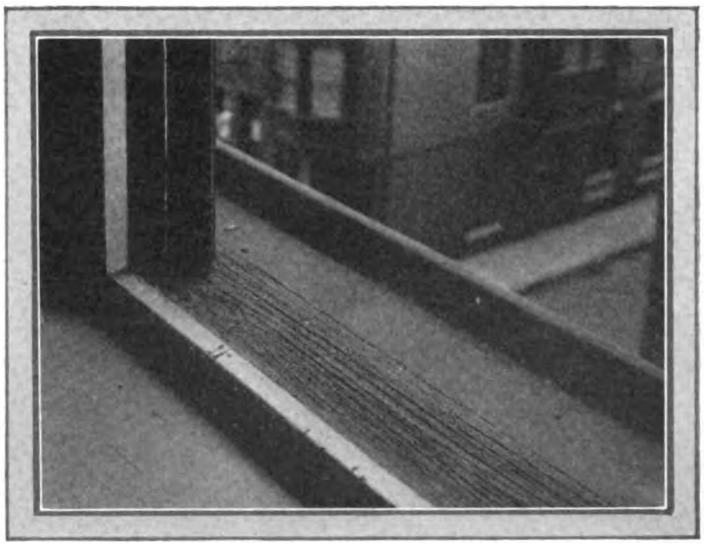


Fig. 7. Another example of deterioration of window sill which undoubtedly was due to the need of paint.

Where surfaces have been previously painted, all loose paint, blistering and peeling paint, should be scraped off or sandpapered down to a solid surface. If the surface has received a number of thick, heavy coats and is "alligatored" or otherwise in bad condition, it may be necessary to burn off the old paint down to the bare wood with a blow-torch. This operation requires extreme care, so that no slow fires are kindled, which later may destroy the property. Leaking spouts or gutters should be repaired and the adjacent surface given a chance to dry out prior to painting. Glossy spots should be "cut" with sandpaper, so that the new paint coat will find proper adhesion, and not "roll up" under the brush.

Mildew

Fortunately, mildew is not a common occurrence. It is found in some industries, and it is frequently very difficult to find a cause for the condition. It is usually found on painted surfaces of a chalky nature. They act as a sponge and afford a ready resting place for foreign material, germs, etc. The presence of warmth and moisture is a necessity for the growth of this germ-life. Unpainted surfaces also afford a ready resting place for the minute deposit of germ-life. These feed either upon the fats in the atmosphere or upon the fatty oils in the paint film itself. When a condition such as this exists, it is very difficult to overcome. Under favorable conditions it spreads and grows, showing itself in the shape of black or gray splotches. Repainting over then effects no cure; as a matter of fact it frequently exaggerates the condition, making it more difficult than ever to effect a cure. A thorough cleansing of the surface with benzole, or by burning off the old paint coat and drying out the surface, a considerable improvement in the condition can be obtained. Furthermore, the use of paints that dry with a hard film will assist considerably in this direction.

Preparation of Metal Surfaces

In the preparation of metal surfaces for painting lies the greatest room for improvement. The road of least resistance lies in the direction of ignoring the presence of rust and corrosion and applying the new coat regardless. Herein lies the greatest cause for the tremendous yearly toll taken by rust and corrosion. And much of it could be prevented, with a little preparatory work.

Rust is like a cancerous growth. It can accomplish its deadly work beneath a "smiling" exterior,—all unnoticed. Removing rust prior to painting is tedious, time consuming work. But the investment made in rust removal pays for itself over and over again.

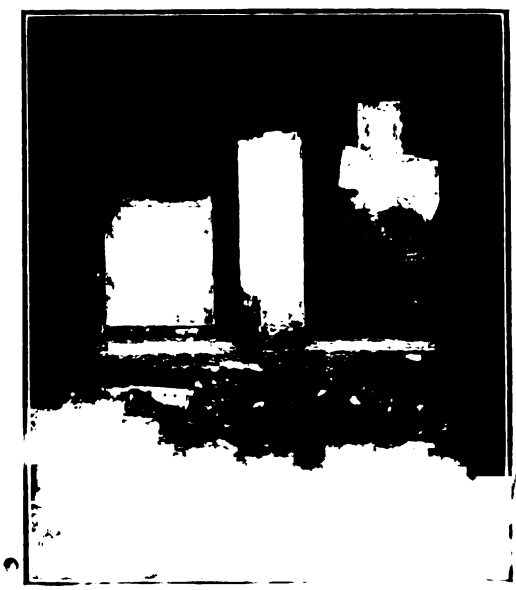


Fig. 8. On such surfaces as this it is advisable to remove the old paint before resurfacing the door.



Fig. 9. Still another example of deterioration due to the lack of proper attention.

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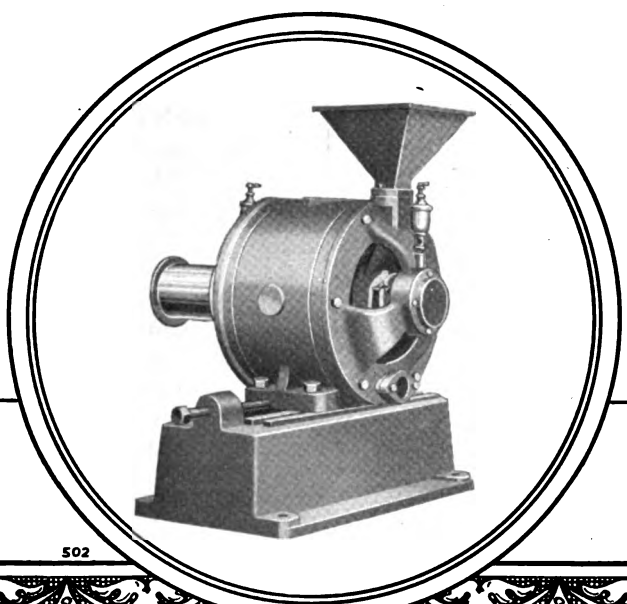
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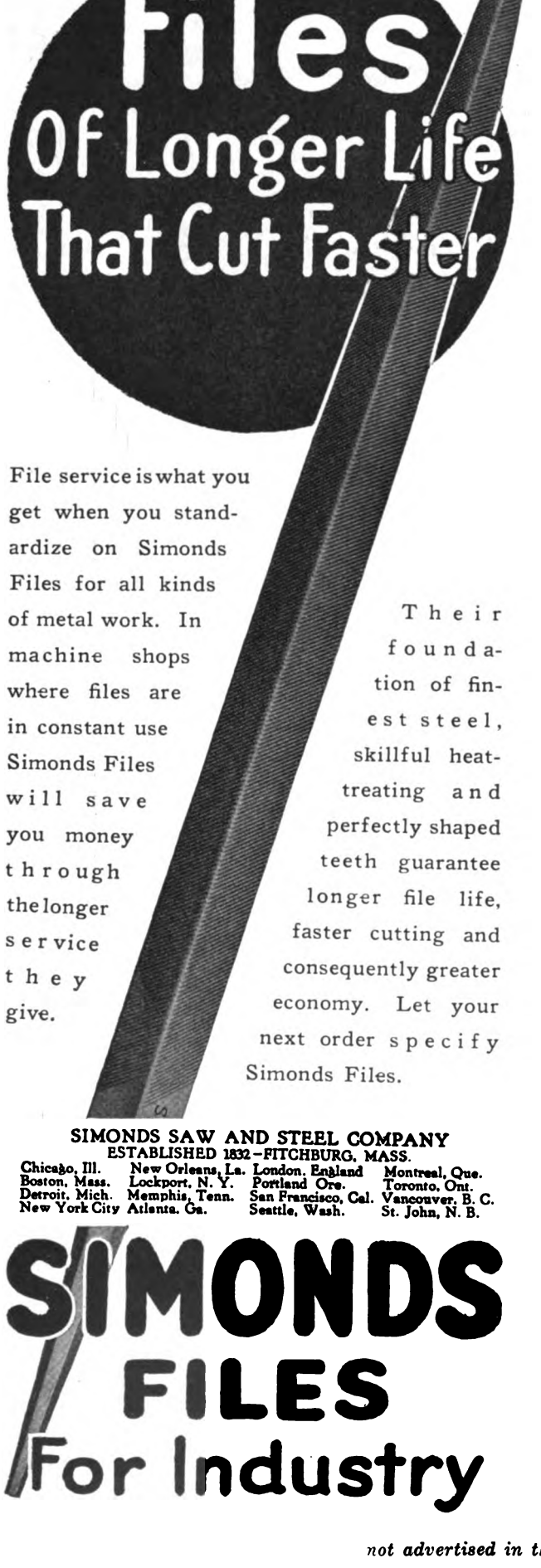
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New metal surfaces should be painted immediately upon erection. This is the only safe method. If they are allowed to go unpainted for a period of time to "weather," the chances are that they will be overlooked and not given paint protection in time. It is far better to prevent the *beginning* of rust, than to try to conquer it after it is present. Mill scale should be removed by wire brushing or scraping. The surface should be dry and clean. Sand-blasting may be used on large surfaces, where necessary to remove an accumulation of scale or "foreign" material. Oil and grease should be removed by washing with benzine or gasoline. Where rust and corrosion already exists, it should be removed by these methods down to the bare, clean metal.

Preparation of Galvanized Iron Surfaces

Painting these surfaces has often brought unsatisfactory results. Opinions vary regarding the treatment of galvanized iron. In the galvanizing process a slight oily or acid film remains. Unless this is removed, paint may be *applied* successfully, but whether it will adhere continuously remains to be seen.

Satisfactory results are assured, however, if the surface is first washed off with a solution made by dissolving eight ounces of copper acetate or copper sulphate in a gallon of warm water. This will remove the film and create a proper "tooth" to which the paint will adhere. After the solution is applied, allow it to dry on the surface. Then the painting may be done with entire satisfaction.

Metal Surfaces Previously Painted

Previously painted metal surfaces are the most difficult to prepare for repainting. These frequently are more or less rusty in spots, with portions of the present paint film still in good condition. For this reason the natural tendency is to ignore the removal of the rust and paint right over it. This does not insure surface preservation, however—and this is the most important consideration. Scrape or wire brush such portions of spots down to the bare metal. Then painting may be done successfully.

The same reasons for insuring dry surfaces for wood apply with equal force to metal. It is somewhat easier to secure a properly dried metal surface for the reason that the porous condition is not present. Most of the moisture remains on the surface. So that if there is but a short space of time for surface preparation, much can be done with the use of a blow torch to accelerate drying. The torch should be used *after* all existing rust is removed. Then apply the first coat immediately, so that additional precipitation of moisture cannot take place.

Paint will not dry on a metal surface that contains oil or grease in any form. This must be removed by washing with gasoline or benzine prior to painting.

Much painting of metal surfaces in industrial plants must of necessity be done during manufacturing operations. These frequently throw off gases, fumes, acids and alkalies which seriously affect the paint coat. This article will not treat upon the nature of the finishes for metal surfaces that will give best results under these conditions. Proper preparation of these surfaces for painting, however, presents real problems. Each case requires a study of conditions to be met and the application of all the known plans for surface preparation. Naturally it is futile to apply the new coat over the accumulatio

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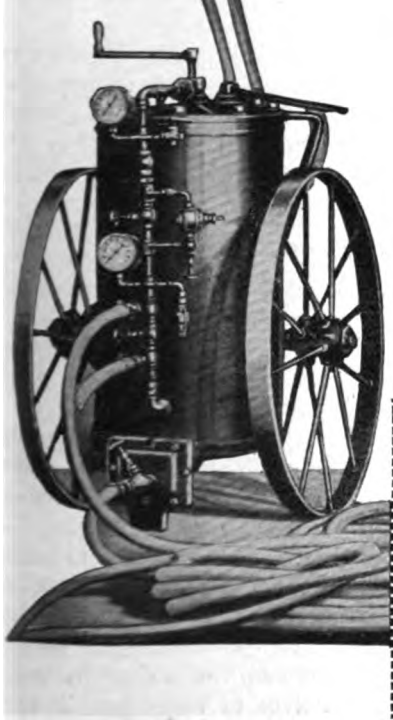
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of the results of contact with these foreign conditions. Thorough cleansing of the surface is the first necessity, followed by a prompt application of the new coat.

Concrete and Cement Surfaces

New concrete and cement surfaces present problems different from any other surface. These structures are built up of materials generally of an alkaline nature. It is a known fact that alkali and fat brought into contact make soap; soap dissolves in water. Result,—a disintegration of the paint film, if applied over an alkaline condition, followed by a washing off of the film on exterior surfaces.

Yet it is not a difficult matter to accomplish satisfactory results in painting such a surface. If sufficient time is not permitted for new or green concrete or cement surfaces to dry out, then there is always a chance for trouble with the paint coat. Moisture will be drawn out and not only take the paint coat off with it, but at the same time bring to the surface more or less alkali, resulting in the condition explained above. It is always best to allow sufficient time for the structure to dry out thoroughly, no matter whether inside or outside work is to be done. Then there is little chance of later trouble developing.

The treatment of surface alkali in these surfaces is simple. A wash coat of a mixture of three pounds of zinc sulphate to the gallon of hot water, applied with a broad bristle brush, will effectually neutralize the alkali and result in a surface fit for painting. This application must dry upon the surface. Then it should be brushed down with a stiff brush, to remove surface crystallization, after which the painting may be done.

At one time the porosity of concrete and cement was an item to be reckoned with in successful painting. Today, however, with greater experience in the makeup of the material, this is not so important a factor. It is still necessary, however, to provide for the *natural* absorption of the surface, so that the first coat must be manipulated to satisfy this need. This should not be considered a part of "Surface Preparation," however.

Hydrostatic pressure is a factor to be considered. In certain types of construction, it is found that a seam is found where the day's "pour" begins. Pressure from without forces moisture through this seam, carrying with it alkalies of various strength, running down over the surface, leaving a white deposit in its wake. It is best not to attempt to paint a surface of this kind, until these excretions cease and the surface is absolutely dry.

Cement Floors

Usually there is little trouble in painting cement floors except where a "hardener" has been used or where the surface has first been treated with a "filler" of some type. In both these instances the paint film frequently has little or no chance to adhere to the surface, resulting in late peeling or loosening of the paint film. New or unfinished cement floors may be successfully painted with any of the standard products, adding a quantity of turpentine or other thinner to the first coat to aid penetration. Naturally, all grease or oil must be removed prior to painting.

In conclusion, surface preparation presents many problems. These must be worked out by the man responsible for maintenance work. Carelessness and imperfect workmanship may be covered up for a time, but eventually they will show themselves in ways peculiar to the conditions that exist.

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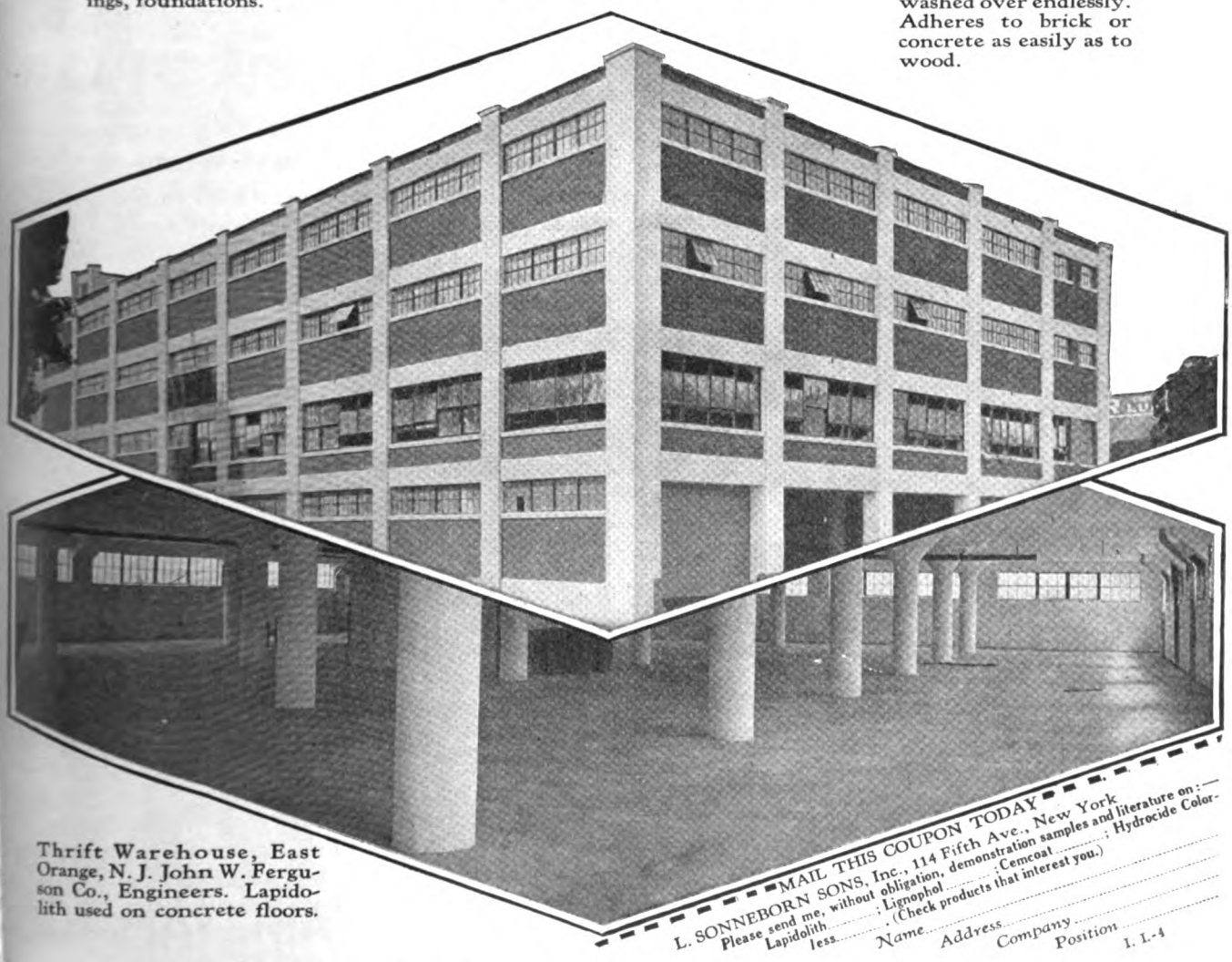
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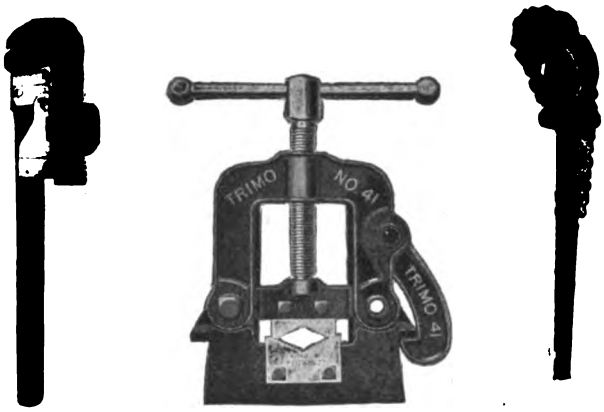


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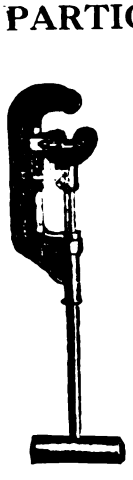
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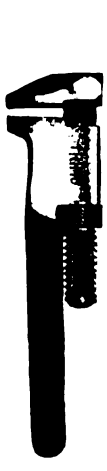
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(*Continued from page* 15)

smaller than that of ball bearings of the same load capacity.

At low and medium speeds anti-friction bearings are relatively quiet but generally develop considerable noise at higher speeds. Because of interchangeability of standard sizes, both ball and roller bearings can be readily replaced. Repairs of anti-friction bearings are generally not recommended, however.

Anti-friction bearings do not have to be run-in as is the case with plain bearings.

Ball and roller bearings require closer manufacturing tolerances for shafts and housings than plain bearings.

In order to perform satisfactorily in service, anti-friction bearing installations should fulfill the following requirements:

(1) Correct bearing size should be selected, for which the advice of the bearing manufacturer should always be obtained.

(2) Shafts and housings should be correctly designed in order to provide proper support of the bearings without cramping or binding, to facilitate accurate machining, to provide for ready mounting and disassembling and to permit of filling, retaining and draining of the lubricant and also to keep out dirt and grit.

(3) Shafts and housing should be accurately machined.

(4) Anti-friction bearings should be carefully handled in assembling and protected against dirt, grit and corrosion.

(5) Only high grade lubricants, free from acid or alkali, should be used. Anti-friction bearings can be lubricated with either oil or grease. Oil is preferred for high speed installations, while grease should be used where leakage is objectionable or where a minimum of attention is required.

Illiteracy and Waste

A WARNING that illiteracy from an economic viewpoint is a source of prodigious waste is sounded by the Civic Development Department of the Chamber of Commerce of the United States in a statement calling attention of local chambers of commerce to vast opportunities for accomplishment in this field.

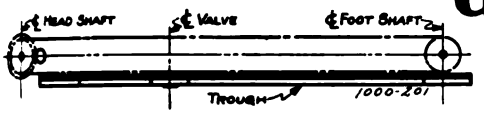
"We have entered upon a new era in business," says the department. "We work in large groups. Coördination and efficiency are dependent upon mutual understanding. Because of the larger number of workers we must be kept informed, the written word again is superseding the spoken word.

"It is a shock then to be told that nearly one-quarter of our adult population cannot read a newspaper, cannot write a letter; that out of a thirty-million population in the 5 to 17 age group in 1924, three million, or one out of every ten, did not go to any school. * * * Three million out of our five million illiterates are native-born which places the responsibility for three-fifths of the illiteracy in the United States upon us.

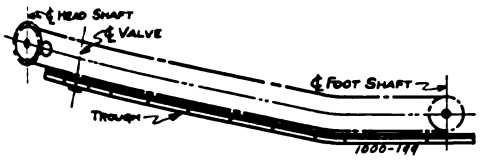
"Illiteracy means waste. Franklin K. Lane estimated that illiteracy was costing this nation 825 million dollars annually. With the increased productivity of other civilized nations our industrial and commercial future depends in large measure upon the standard of living which our own population is able to earn. A comparison of the most illiterate and the least illiterate states with respect to the production of wealth suggests a ratio between literacy and the production of wealth."

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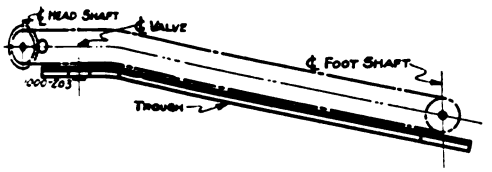
Irregular Outline No Handicap



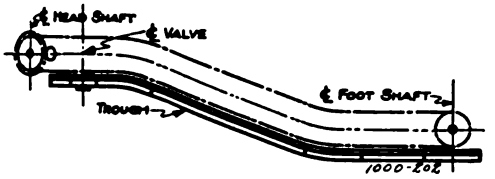
Horizontal Conveyor for along ground or over storage bins.



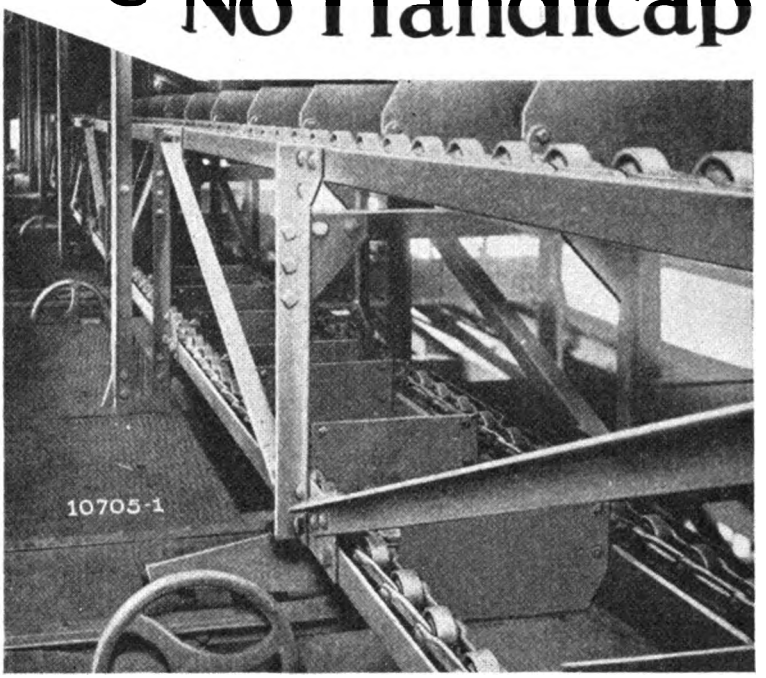
Combination Conveyor, horizontal receiving section and slope to pile or bin.



Combination Conveyor, up slope from receiving hopper and over bins.



Combination Conveyor, receiving section up slope and over storage.



for the Jeffrey Scraper Conveyor

IN a power plant of moderate capacity with an awkward, irregular outline for the coal handling conveyor—inclined, horizontal or a combination of the two—you have a job for a Jeffrey Scraper Conveyor.

It's an easy conveyor to install and is reliable.

Can be loaded at any point. Discharges anywhere by means of one or more valves placed in the carrying trough.

Our Engineers will appreciate an opportunity to help you solve your problem.

Ask for the bulletin showing the Scraper Conveyor and seven other methods of coal handling.

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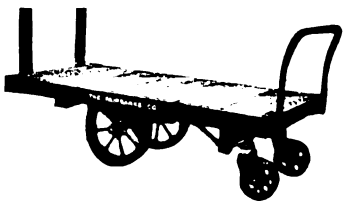
No matter where you are located, there is a mill supply dealer within a few miles who can deliver from stock any one of 26 different models.

Just keep in mind in ordering factory trucks that *the best will always be made of wood—steel-bound*, and that "best" can be delivered at your door the same day you telephone.

Order by number from our truck catalog.

THE FAIRBANKS COMPANY
Broome and Lafayette Sts., New York, N. Y.

Fairbanks



(*Continued from page 20*)

essing machines can be equipped with direct-connected motors (and do not require heavy foundations) the final stage of freedom of placement is attained.

The machines may be located without regard to any consideration other than their most efficient position with relation to one another. It would be possible, in a machine shop, for instance, to arrange a group consisting of a lathe, drill-press, milling machine, shaper, and multiple spindle drill, in a circle so that all parts could be passed directly from one machine to the next in the order of processing. The same would apply to a wood-working shop in which a saw, jointer, mortiser, and sander could be placed with reference only to the convenience of handling material. In the latter case, this would probably result, also, in reduced runs of ducts connecting with the dust-exhaust system. Similar grouping arrangements can be worked out for a great variety of industries, resulting in a handling efficiency higher than any hitherto obtainable.

The problem of plant layout now has but a single aim —efficiency, unhampered by such limiting conditions as line-shafts, posts, and columns, as well as tracks, whether overhead or under-foot. Moreover, the position of the machines is not semi-permanent. They can be moved about and re-arranged without further effort than that required to remove the hold-down lag-screws. Wherever they are placed, they are always accessible to the transportation system. Contrast this with the job of millwrighting necessary to re-arrange a department under the old system of mechanical drive and track transportation.



Your Final Choice will be VICTOR

Every day there are more concerns coming to the Victor blade after trying other, inferior blades which were represented to them as "just as good a blade."

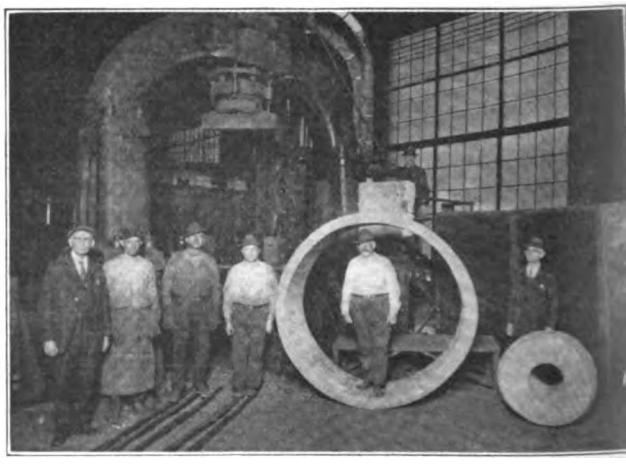
The more cutting you do, the more opportunity you have to see the difference in hack saw blades.

Why waste money experimenting when your final choice will be Victor?

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

An Unusually Large Forging

THE accompanying illustration shows the largest retaining ring that has ever been forged in the Schenectady plant of the General Electric Company. The ring weighs 4½ tons and is to be used in a 60,000-kw turbine-generator now under construction at the Schenectady plant. The ring was forged from a solid billet



of nickel steel 32 inches in diameter and 42 inches long. A small hole was pierced by a 6-ton forging hammer 11 inches in diameter and by successive heating and forging under a 3-ton hammer, the ring was enlarged to the size shown. The outside diameter of the completed ring is 79 inches and the inside diameter is 69 inches. The face measures 27 inches across.

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Cocheco - Like Time—Never Stops

Somewhere, always, all around the clock, Cocheco Belts are driving the machinery of the world's industries.

"Making time" in a well known clock factory, turning the wheels in machine tool plants, giving maximum satisfaction under severe conditions in tropical coffee plantations, in ice plants, quarries and lumber mills and camps.

The quality of Cocheco Belts guarantees satisfaction wherever leather belting can be used—and the best leather belting is the choice *for service* on most important machine drives.

COCHECO TRADE MARK BELTING

The Cocheco booklet on belts tells the story of Cocheco Belting—write for it.

J. B. Williams & Sons, Dover, New Hampshire, U.S.A.

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WHY INDUSTRIAL PLANTS BUY THEM

Many of the biggest plants in the nation use Witt Corrugated Cans and Pails because they stand rough usage, and have a much longer service-life than any other can on the market.

They're made of a special analysis sheet steel; body is interlocked with raised bottom; side seam is double locked. Heavy steel bands are riveted top and bottom and take all the wear. A heavy coating of hot-dip galvanizing makes them watertight and fireproof.

Witt pails are preferred as tar buckets, mud buckets, ice buckets, mop pails, etc. You will be surprised at the long rough usage a Witt Pail will stand before showing signs of wear. They are guaranteed to "stand the gaff."

A trial order would convince you of the number of uses you have for Witt Cans and Pails, and how they reduce reorder expense to a minimum. Phone your jobber, or write

THE WITT CORNICE COMPANY
2111 Winchell Ave.,
Cincinnati, Ohio

Manufacturers of

WITT
CORRUGATED
•CANS and PAILS•

(*Continued from page 24*)

out proper lubrication, and it is the same with leather. The fibres must be lubricated, otherwise internal frictional heat is generated; causing the belt to lose its carrying greases and therefore become dry and hard. This condition causes cracking and premature breakdown on the drive. One of the worst belting conditions found at the Oakland Plant was the promiscuous use of rosin as a remedy for belt slip. Rosin is a destroyer of leather belting because it absorbs the natural and applied greases and it also destroys its power transmitting ability because in combination with the greases, lumps are developed between the belt and the pulley causing loss of contact.

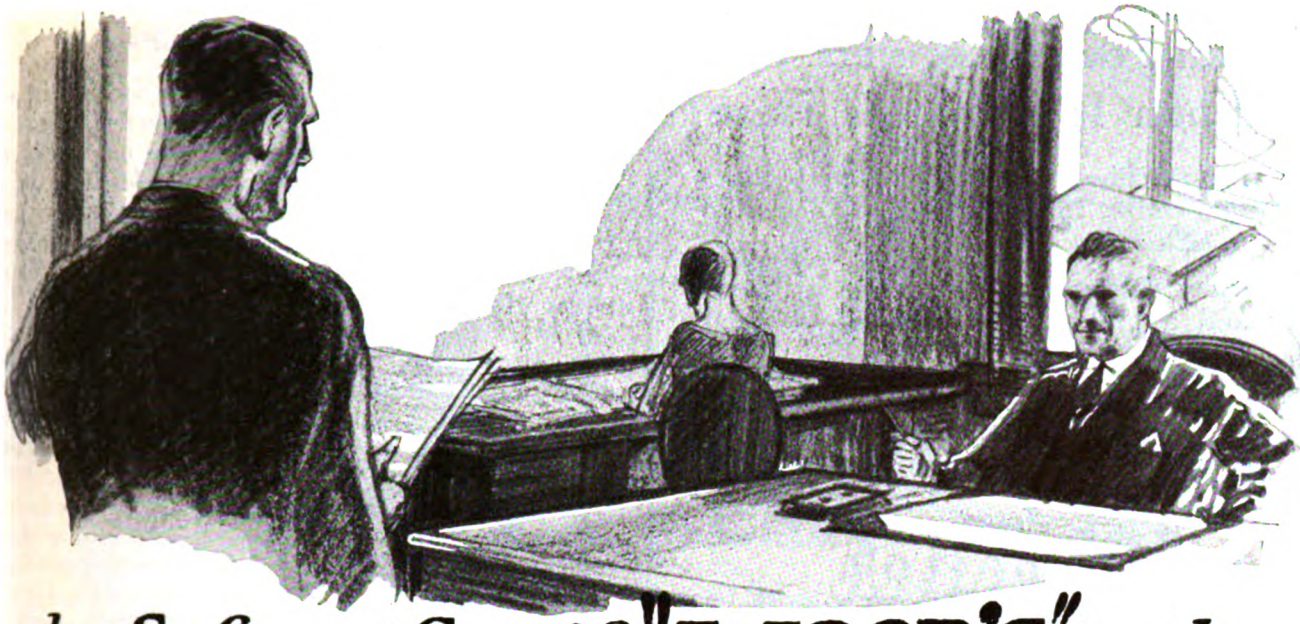
The real problem of the investigator is to make recommendations for renewal belting, therefore he must concentrate on the operating conditions rather than the mechanical details while making the study. The mechanical arrangement of each individual drive can be recorded by the assistants and incorporated in the operating data taken by the belting analyst. This method was employed at Oakland. Every one of the sixty-two departments was surveyed, drive for drive, and at the completion of the plant work, which required four weeks, over three hundred letter size sheets of data had been taken. This work was greatly facilitated by the hearty cooperation of Mr. H. R. Boyer, Works Engineer of the Oakland Motor Car Company and the various foremen and machine operators.

The plant work of collecting the belting operating and mechanical data, is in reality the foundation of the work because naturally it is from this that the final plant belting recommendations or schedules are built. It requires weeks of study of the data obtained by the investigator before he is in a position to make recommendations for type and size of belting for each individual installation because the recommendation is final and must increase the production of the machine and lower belting maintenance costs. It must not be assumed, however, that there were no correct belting installations in the Oakland Plant, because this is far from true. This system recommends changes only where they are deemed necessary. At the Oakland Plant four thousand drives were studied and approximately one thousand of these were found to be of the correct type and size.

At the completion of the entire study the work must be presented to the plant in a concise and practicable operating form, otherwise the effort is useless. After many years of plant belting survey work the writer devised the system which is now in effect at Oakland and other units of the General Motors Corporation. Primarily the plant is interested in the location of the drive, the operating belting at the time of the study, the recommended type and size for renewal and the correct method of joining the recommended belting, therefore this data for the entire plant is tabulated in typewritten form on linen paper and bound together in a loose leaf book segregated into the various departments and sections of the plant. Every machine tool or battery of machines is listed by the plant number so that a change in position of the tool does not interfere with the recommendation. The book is usually kept by the plant engineer or the man in general charge of all belting of the plant. To facilitate the belting supervision of the man in charge of each department a separate folder of the belting recommendations for that particular section is furnished. This compares exactly with the similar department in the book

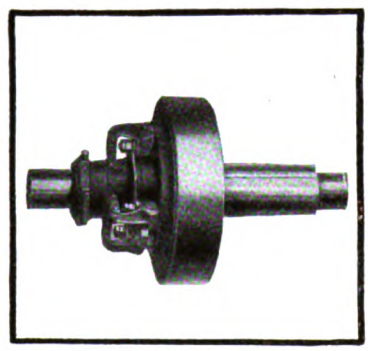
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play Safe and Specify "WOOD'S" in the new plant

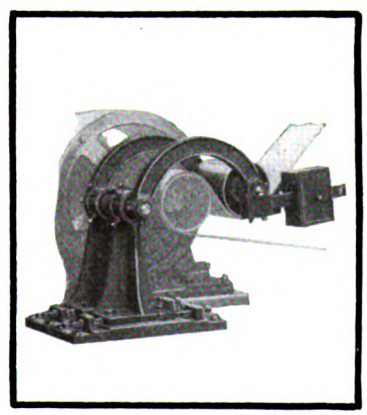




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Wood's line of transmission machinery covers your every need from the smallest coupling to a giant sheave or pulley.





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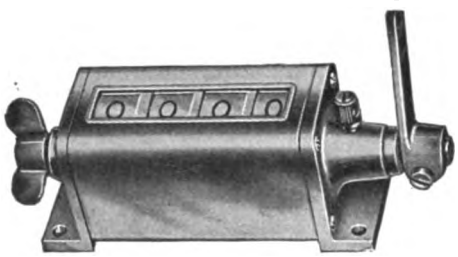
Let machine-hands watch their production-count, and they watch their step to *better* the count.

They give you a higher rate of work, and a higher rate of profit *on* their work.

Individual output *makes good* when it has to make a record. Man-power registers *HIGH* when it registers on a

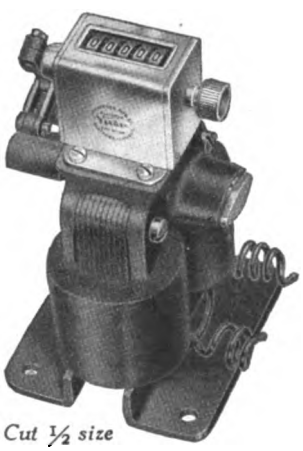
Veeder

The *Revolution Set-Back Counter* below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, $10.00—subject to discount. Large Set Back *Rotary Ratchet Counter* to count *reciprocating* movements where these count the product, $11.50 (list). Cut ½ size.

This "Form UM" Magnetic Counter counts operations or units of output from any distance that wires connect with machines.



Cut ½ size

Installed in your office, it indicates work being done by the man and machine out in the factory.

Mechanical contacts on your machine make and break the electrical circuit which operates the counter. The electro-magnetic drive can get its current from your regular lighting circuit (direct current, 110 volts), or from storage battery.

Write for the full-line Veeder booklet of mechanical and magnetic counters for all machines.

The Veeder Mfg. Co.

31 Sargeant Street, Har

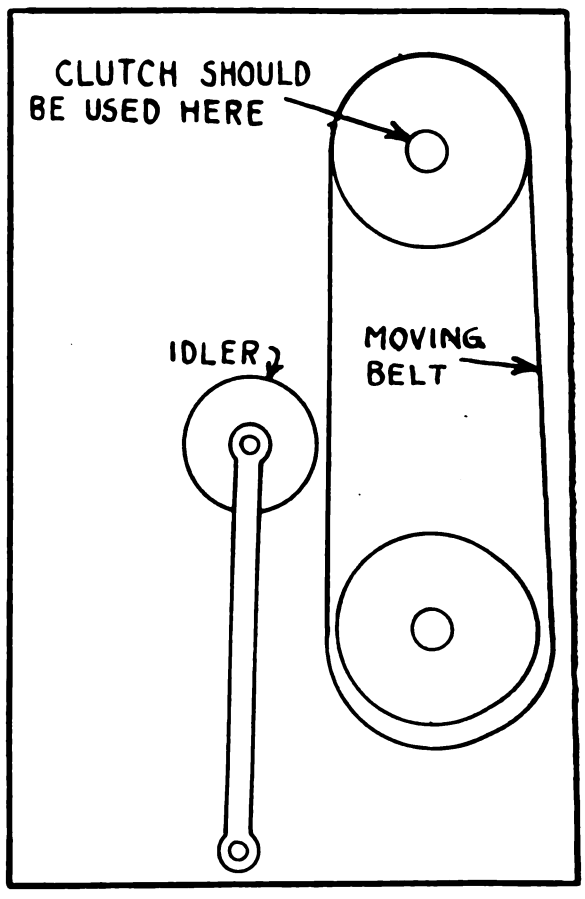
Some Power Saving Hints

By W. F. Schaphorst

THE makeshift money and power wasting contraptions that one sees in many shops and mills of today is astounding. Just the other day I was in a large plant where I saw a drive of which I made a sketch and which I am showing herewith. The drive is vertical with the upper pulley continually running. The belt is made long as indicated so that it dangles down below the lower pulley when the idler pulley is released.

When the idler is released there is not sufficient friction between the belt and lower pulley to operate the drive to which the lower pulley is connected by means of a shaft, consequently by simply shoving the idler against the belt the machine is caused to start or stop at the will of the operator.

This is a very poor design in view of the fact that an inexpensive friction clutch connecting the upper shaft to the upper pulley would serve the purpose much better. A clutch would be much safer, there would be far less belt and pulley wear, and there would be practically no power loss.

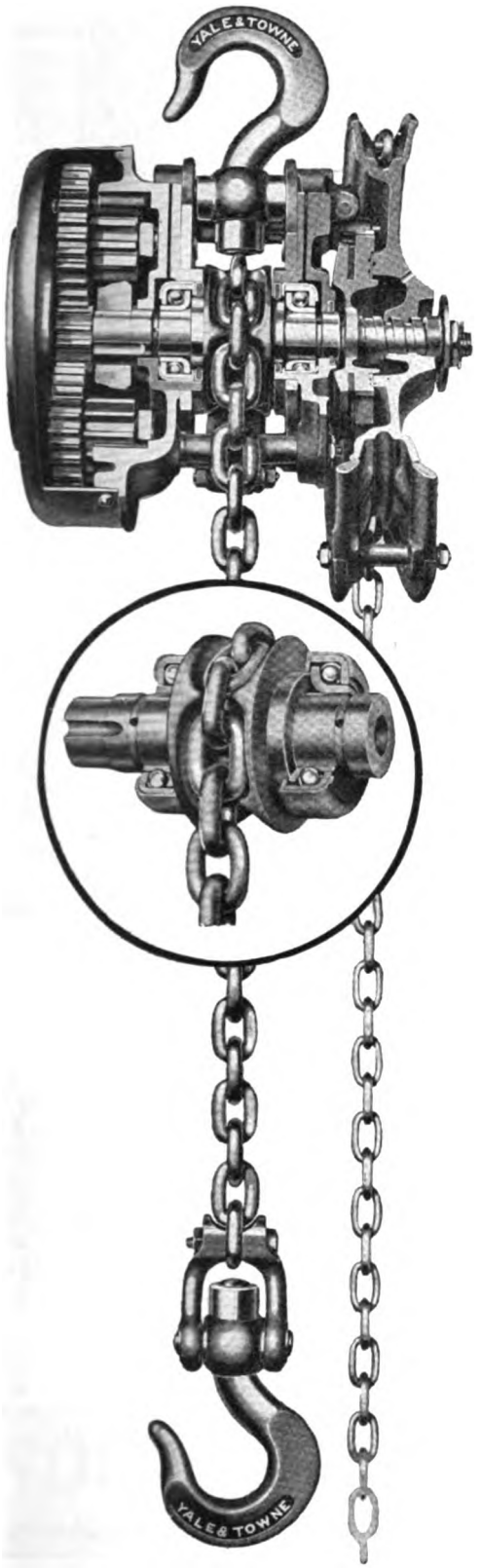


Where such belt drives are used a friction clutch is more ef cient than an idler and reduces belt wear.

As it now is the belt is continually moving even whe the machine is not used and I noticed that the machi is used very seldom during the day. In the meantir the belt is whipping around loose, wearing itself out, co suming power, and endangering the lives of those wh come near it. If the belt would maintain a perfect straight and even position such as is illustrated, it mig not be so bad, but of course it doesn't. The belt is co

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TRADE **YALE** MARK

Yale Ball-Bearing Chain Blocks for easy operation

When you see a Yale Ball-Bearing Spur-Geared Chain Block demonstrated for the first time you will be amazed at the lack of friction which enables the operator to lift a load with only a slight pull on the hand chain.

The secret is in the fact that Yale has put the ball-bearing equipment on the load sheave *where it should be.*

The accompanying cut shows a magnified view of the Yale load sheave with ball bearings. The races are cut open to indicate the location of the ball-bearings. Yale engineers designed this construction,—with one piece load sheave and chrome vanadium ball bearings,—to give perfect concentricity and minimum friction.

This feature alone will commend the Yale Ball-Bearing Chain Block to prospective purchasers. A few of its other points of superiority are as follows:

—*The steel load chain* is die formed, side-welded, heat-treated and gauged.

—*The suspension plates* are heavy wrought steel.

—*The one-piece driving pinion shaft* is heat-treated and ground to size. These processes insure a tough and smooth shaft.

—*The pinion cage* which contains the steel gear and pinions is made of tough malleable, insuring against the possibility of breakage under shock conditions.

—*The detachable shackle* and heat-treated oval pin which connects the hook to the last link in the steel load chain make it possible to lengthen this chain in the field without hand-welding.

The Yale Ball-Bearing Spur-Geared Chain Block when used with a Yale Roller-Bearing Trolley—from "Hook to Hook a Line of Steel"—provides the maximum in safety and efficiency.

May we send you literature which states the Yale facts fully and concisely?

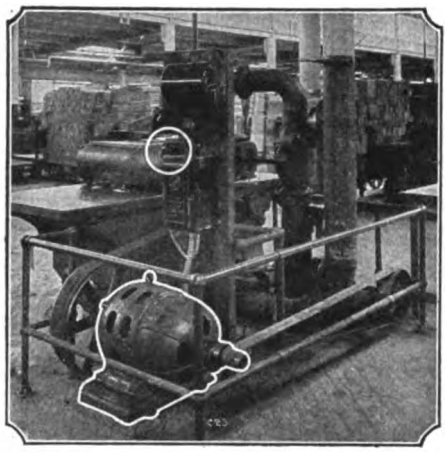
The Yale & Towne Mfg. Co., Stamford, Conn., U. S. A.

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Hoisting and Conveying Systems

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"... push-button control" without extra cost!







Here's the simplest, cheapest, and most efficient push-button control there is. No compensator, simple wiring. Motor size makes no difference. TR Self-Start operating characteristics make it possible. The installation is in the Globe-Wernicke plant at Norwood, O.

Send the coupon for more information and quotation on sizes needed.

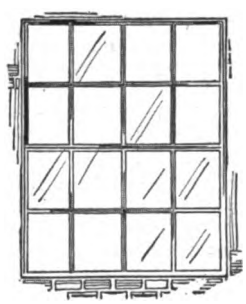
THE TRIUMPH ELECTRIC CORP.
157 E. 70th St., Cincinnati, Ohio

The TR is an A.C. motor with improved operating characteristics—the modern super-motor. 250% starting pull instead of usual 80%. No compensator in any size. Cuts first cost and current costs. Junk old motor ideas and improve plant efficiency with the TR motor! Send coupon.

The Triumph Electric Corp.,
157 E. 70th S., Cincinnati, O. I.I.
Send TR motor bulletin and price list.
We need motors for these machines,
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(with) (without) push button control.
Name .....
Firm Name.....
Address .....
City..... *State*.....

Clean Windows

Safely Cleanly



no acid to injure workman or damage machines or tools

no water to damage merchandise or machines

A Clean, Quick, Safe Job. Sunburst Paste removes the heaviest rust, grime, carbon, paint and dirt and leaves the window brilliantly, highly polished. A moist paste, Sunburst is applied with cloth or brush—no slopping of dirty water or dangerous acid. Any laborer can put it on and rub it off—quickly. No rinsing necessary. Adapted to practically every kind of window. Cleans some windows that acid won't. Unqualifiedly guaranteed. We cancel your invoice on a barrel, half or quarter barrel if it does not perfectly satisfy you.

SUNBURST
WINDOW CLEANING PASTE

We also manufacture liquid window cleaners as well as Thesco Organic Cleaner, Soft-as-Silk Liquid Soap, Hexstercide Insect Killer, Hykotar Disinfectant—everything in Industrial Sanitation.

THE GERSON STEWART CORP.
3541 E. 76th S Cleveland, Ohio

tinually waving and flopping from side to side during the entire day. I daresay that there is much more wear when the belt is not being usefully employed than when it is in service.

By all means don't use a drive like this. If the lower pulley were the live pulley, as is sometimes used for driving overhead shafting with an arrangement similar to this, it would not be so bad. However, there is no good excuse for using a makeshift device like this permanently with so many excellent and inexpensive friction clutches on the market.

This particular drive measures about 14 feet from shaft center to shaft center. The belt is of 6-inch double leather. Any user or buyer of belting will be able to quickly make an estimate of the expensiveness of this drive.

In another room in this same plant I found some large machines, all of them running at full speed, and nobody in the room using them. I have seen similar instances before but never on so large a scale. Such waste as this is inexcusable. A friction clutch could be used on each machine as well as not. The time required to throw a clutch in and out is insignificant and worth more to the owner than the cost of fuel wasted for driving the machinery and the cost of replacements due to extravagant wear and tear.

In another department I found machines that were driven by individual electric motors. I found a number of them humming along merrily with nobody at the machines and the machines doing nothing. One of the great advantages of individually driven machines is the power saving that accrues from shutting off the motor as soon as the operator has finished with the machine. The current required to run a motor at no load is often considerable. Besides, there is the additional loss due to wear the structural losses due to vibration, and the unnecessary use and cost of lubricants.

By all means, shut off individual motors when machines are not in use.

New Tinning Process

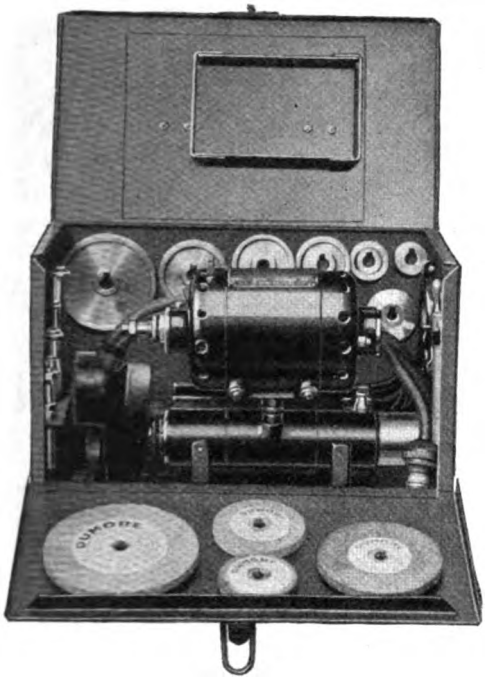
A NEW method of heating sheet metal tinning pots utilizing electric heat, has been devised by the General Electric Company. Among the advantages claimed for the new method are desired thickness of tin deposited at all times; need of attendance eliminated through automatic control; loss of tin, through overheating and excessive oxidation, eliminated; danger of firing oil eliminated; low maintenance and long life, and better working conditions in the shop, dirt and gases being eliminated and room temperature lowered.

One of the new, electrically heated tinning pots has been in operation for several months in a steel mill. The tin is heated by means of cast-in electric immersion units located inside the pot and automatically controlled. Temperature fluctuations are prevented, a uniform coating of the sheets is secured and the danger of firing the oil or oxidizing the tin is eliminated. The connected load for the pot is 125 kilowatts and the hourly consumption is approximately 85 kilowatt-hours, giving an average of but 4 kilowatt-hours per base box.

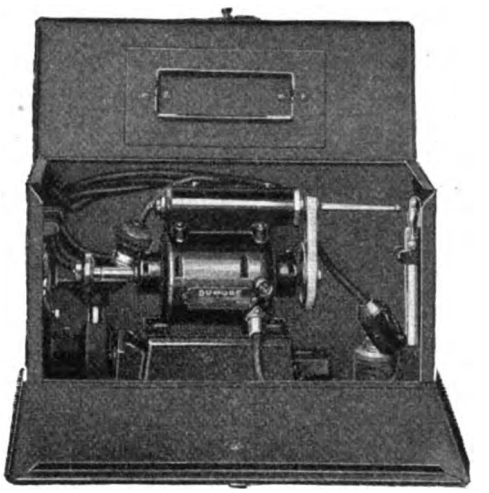
It is expected, that, by the use of the electric method the over-all cost of tinning will be considerably reduced and a more uniform and better quality of product obtained.

...cts not advertised in this issue write Industry Illustrated

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Dumore No. 3 Grinder and Equipment



Dumore No. 2-AG Grinder and Equipment

Now—More Practical Than Ever

ALL No. 2-AG and No. 3 Dumore Grinders are now furnished with a steel carrying case that holds the grinder and all the tool and wheel equipment.

This feature increases the ease of carrying the grinder from one job to another. The wheels and tools are kept with the grinder, saving extra steps and valuable time. The grinder and equipment can be checked in and out of the tool room as one unit and are protected when not in use.

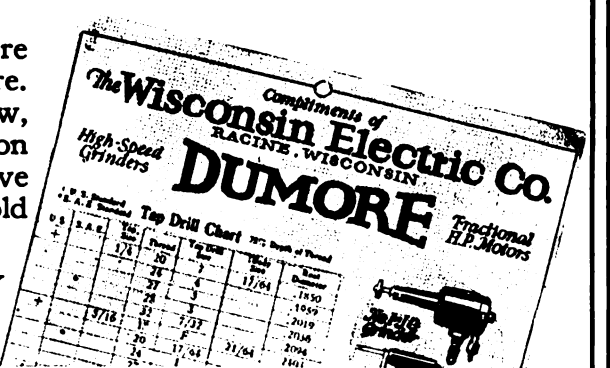
With this new steel carrying case the Dumore Grinder is more practical than ever before. Trade in your old grinders (any make) on new, steel-case equipped Dumores. Mail the coupon for details of our exchange offer. We will give you a liberal trade-in allowance on your old grinders.

WISCONSIN ELECTRIC COMPANY
70 Sixteenth Street Racine, Wisconsin

Dumore Grinder Advantages

There are six Dumore Grinders with individual speed ranges from 3,600 to 50,000 R.P.M. Correct speed without vibration, eliminates taper, bellmouth and chattermarks, common with less efficient tools.

Use the Coupon below, it will bring one of our Tap Drill Charts and complete details of our new exchange offer.



DUMORE

High Speed Electric Toolpost Grinders

Mail the Coupon—It will bring a Free Tap Drill Chart and complete details of our trade-in plan.

FILL IN CAREFULLY

Wisconsin Electric Company, 70 16th St., Racine, Wis.

Please send me Free, a Tap Drill Chart, your latest grinder booklet and tell me what allowance you will make on the Grinder I have now. This grinder is

.....

(Insert make and model of Grinder you have on this line)

Name .....

Address .....

City ..... *State* .....

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FAMOUS SEXTETTES

6-FAMOUS TOOLS




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6-FAMOUS SCULPTORS

The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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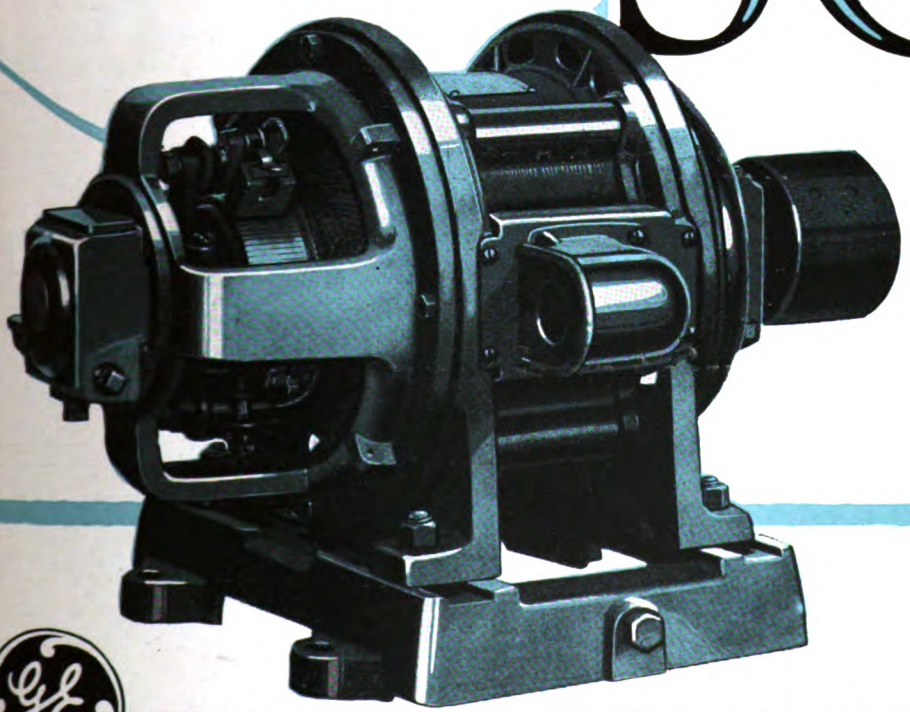
THE G-E SINGLE PHASE MOTOR

Simplicity
Positive Operation on Low Voltage
Unusual Torque Characteristics
High Power-Factor
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Strong Construction
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make the "SCR" the outstanding single phase motor and assure that satisfaction which accompanies an investment in G-E products.

TYPE

SCR

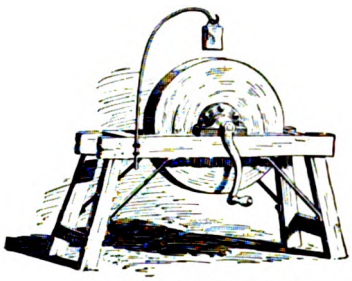


GENERAL ELECTRIC

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Why

"SCR" is the outstanding single phase motor



Speaking of Simplicity!

Simplicity—

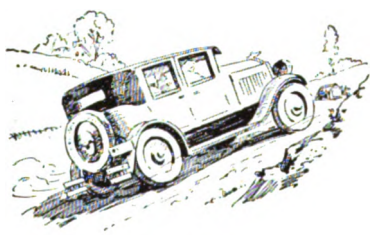
No internal switches or centrifugal devices—no complicated moving parts.



The hurdle that balks many single phase motors!

Low Voltage—

A 110-volt "SCR" will start, accelerate, and carry its load on 75 *volts.*



Good at uphill work!

Torque—

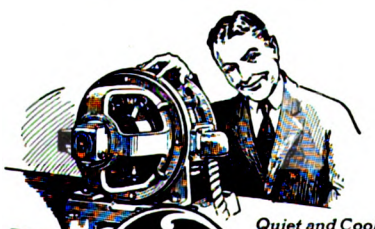
Starting torque 3 times full load torque. Accelerating torque and maximum running torque twice full load torque. Smooth and even acceleration—no dips in the torque curve.



The pointer hovers near 100!

Power-Factor—

High power-factor coupled with low starting current and *high efficiency* results in low operating cost.



Quiet and Cool!

Quiet and Cool—

Through liberal design, the "SCR" is quiet at start and at full load—and is cool running.

"SCR" Motors can be furnished equipped with ball bearings if desired.

GE Motorized Power

—fitted to every need

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Willson-Weld Glass

for Welding and Cutting

We are making immediate deliveries on welding helmets, handshields and goggles equipped with Willson-Weld Glass,—the most protective welding glass ever produced. Willson-Weld Glass cuts out more than 99% of the injurious rays. Let us tell you more about the welding glass you will want.

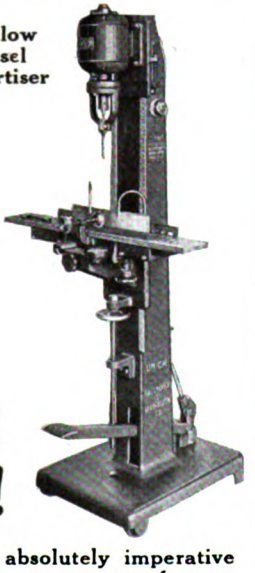
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WILLSON GOGGLES, INC., READING, PA.

Largest factory in the world manufacturing goggles, welding helmets, handshields and respirators.



20" Band Saw



Hollow Chisel Mortiser

Cut Rising Costs!

Steadily mounting costs make it absolutely imperative for woodworking shops to get the utmost out of every piece of shop equipment. Only efficient operation can yield a good profit in the face of sharp competition.

Gallmeyer & Livingston Union Woodworking Machinery fills a real need brought about by modern conditions. Gallmeyer & Livingston Woodworkers are as accurate and long wearing as the costliest machines built. In effect, they are large machines, trimmed down like an athlete, without an ounce of useless bulk or weight.

They will handle all the average work of small plants and the bulk of the work of large plants cheaper and better.

GALLMEYER & LIVINGSTON CO.
412 Straight Ave., S.W., Grand Rapids, Mich., U. S. A.

Carries FULL Load

Without Slipping



This shop belt was run "tight as a fiddle string" but still slipped. Finally an extra piece of belt was inserted and the whole Cling-Surfaced to increase its pulley contact.

Now this sagging belt has 63° greater wrap on large pulley, and 25° on the small one, and carries a full load without slip.

Cling-Surfaced belts run slack stop power losses—prevent bearing troubles—relieve shaft and machine strain. And belt life is multiplied.

Test Cling-Surface for 60 days before you pay. Order 3 or 6 gallons *on trial*. Tell whether or not your plant is warm, dry, dusty. Clip this ad as a reminder to write Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Openings for good salesmen

Cling~Surface

The Scientific Belt Treatment

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At Your Call

Hollow Screws are the last things that go into your assembling jobs; often the last things you think to *order*.

To save you hold-ups in assembling, complete-line stocks of Allen Screws are close at hand in most all cities; rush-orders welcome!

Leading Jobbers the country over carry full-line stocks of Allen Screws, replenished by immediate shipments from factory reserves.

Quality of distribution keeps step with quality of the product. Allen Screws are kept on hand by the class of Jobber who keeps you going—with the goods you need *when* you need them.

The Allen Mfg. Co.

127 Sheldon St., Hartford, Conn.

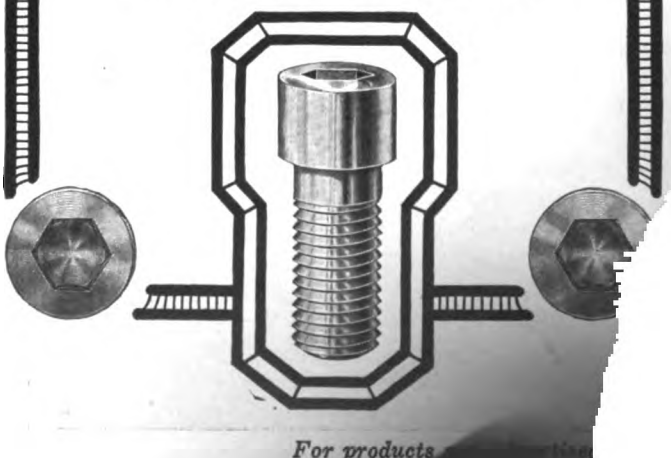
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For products ... tion

Power Transmission Topics

By S. F. Wilson

THE formula that is used probably more than any other in the transmission of power through belts is this one:

$$H.\ P. = \frac{(T - t)\ s}{33{,}000}$$

Where T=Tension in lb. on the tight side;
t=tension on the slack side pounds;
s=speed in feet per minute.

The writer has often wondered why it is that engineers who develop formulas persist in leaving a number in the denominator when it can as easily be placed in the numerator. It is much easier for most of us to multiply than to divide. The process of dividing is generally slower and more vexing. Thus, the above formula may be written in the following form and still be almost as accurate as in the original:

$$H.\ P. = .0000303\ (T - t)\ s$$

Belting a Vertical Shaft

To connect a vertical shaft with one that is horizontal by means of a belt necessitates a so-called "quarter turn drive." Because of the 90-degree turn it is advisable to allow ample space between the pulleys. One well known rule is: "Multiply the width of the belt in inches by the diameter of the driving pulley in inches and extract the square root; then multiply by 10." The result, I presume, is the distance between pulley rims in inches. The author does not state. Anyway, my advice is: Of the two above rules, use the one that gives the *largest* result.

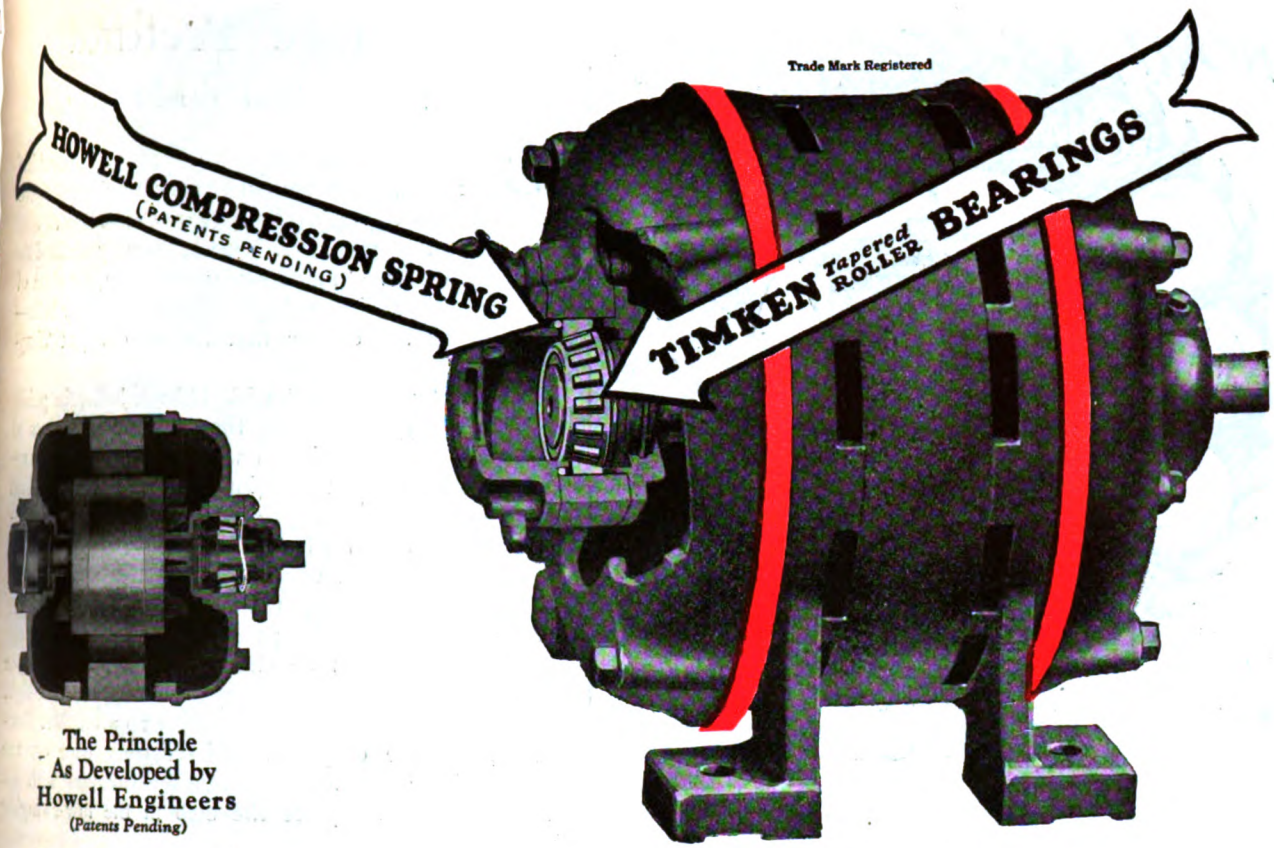
The weight of the belt itself is usually a hindrance to a good and easy distance between shaft centers because of the tendency of the belt to drop away from the pulley on the vertical shaft. For that reason a light belt is advantageous. The lighter the better. Also, a pulley on the vertical shaft having considerable crown is more liable to hold the belt in position than is a pulley with small crown.

Before resorting to the use of idler pulleys to hold the belt in position on the vertical shaft pulley it is well to do some experimenting by shifting the pulley on the vertical shaft up and down and "trying" various positions. Avoid the idler if possible.

PRODUCTION of lead, zinc, and copper appears to be in excess of immediate needs. But with the coming of spring, an increase in the output of automobiles, resumption of building on a larger scale, and ... of electrical work and equipment will create ... nd for nonferrous metals.

... more mines are being equipped with ... saving machinery and equipment, and ... odern methods of treating refractory ... ting more metal from low-grade ores. Th... standstill in the course of such impro... here is constant research as to how operat... reduced.—*LaSalle Extension University*

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The Principle As Developed by Howell Engineers
(Patents Pending)

The outer race or cup of The Timken Tapered Roller Bearing is fitted into the housing of the motor end bell with a sucking fit which allows creeping of the outer race. The bearing is shimmed with a compression spring which is held tight against the outer cup of the bearing by a grease cap. The action of the spring pushes the cup tightly against the rollers thereby keeping the bearings snug at all times—automatically taking up wear and eliminating noise, and removing practically all chances of bearing trouble.

Timken Roller Bearings *plus*—an Automatic take-up!

The Howell method of roller bearing application (illustrated above) is the last word in electric motor construction. It practically eliminates all bearing trouble (and 95% of all electric motor trouble can be traced to bearing failure). It insures a continuous uniform air gap in which any looseness in the bearing caused by wear or otherwise is instantly and automatically taken up. It keeps the rotor centered at all times and allows for any lateral expansion of the shaft which might occur due to heat.

Howell Red Band Motors have always been known for their ability to master hard jobs—equipped with Timken Bearings they are even more dependable, more staunch than ever.

Howell Red Band Motors with Timken tapered roller bearings are offered in all sizes and types in addition to the regular motors with re-centering sleeve bearings. Get in touch with the Howell representative in your locality or write direct to the factory for complete information.

Give Red Bands your hard jobs

Howell Electric Motors Company
Howell, Michigan

Howell RED BAND ELECTRIC Motors (90)

Make Good on the Hard Jobs

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The Marvel of Sawdom

ONAN "SAFTY SAW" will cut crating costs **50%** and sawing costs **90%**. Think of the profit this will make in your shipping department, and what it means to eliminate hand sawing! Think of the crating lumber that can be salvaged quickly and economically!

Of all the machines ever devised to speed up work in the shipping room or to save lumber, none have ever cut costs like **ONAN "SAFTY SAW".**

With this MARVEL OF SAWDOM, one man can do the work of ten men sawing by hand. He can cut lumber for crates, build bins, resize boxes, reclaim scrap lumber—all at a saving as high as 90%. Cross cuts, rips, miters—any sawing job, carpenter work, maintenance, repairs.

ONAN "SAFTY SAW" is PORTABLE, can be moved anywhere on wheels provided (not casters). Runs from the lighting socket. Easy to handle.

Shippers everywhere, large or small, are using and praising the **"SAFTY SAW".** Why not try one at **OUR expense.** Tear at the black line, sign and we will **mail** details and our free trial suggestion. No obligation or expense on your part, nor will a salesman bother you.

D. W. ONAN & SONS

204 Royalston Ave., Minneapolis, Minn.

D. W. ONAN & SONS, 204 Royalston Ave., Minneapolis, Minn.

As per your advertisement, we would be interested in further details on **ONAN "SAFTY SAW".**

We have direct current.....Alternating current.....

Name.....

Company.....

Street.....

City.....

Voltage Preferred

By Elton Sterrett

"SEE here, Mac, here's the third requisition within a month from your department for electric lights What are you trying to do, light the whole town?"

"It looks that way, Mr. Norris," ruefully admitted th chief electrician. "Hardly a day goes by that some o the boys in the polishing bay don't come to me for bulbs- always with the excuse that the old ones just 'disap peared.' "

The plant was lighted with 110-volt bulbs, the publi utility company furnishing the current, and the loss c lamps through depreciation was negligible, while the re placement of lamps mysteriously missing was appallin Guards, of the lock-on type, were considered by the ma agement, but rejected because of the shadows thrown b the enclosing wires, which caused faulty work throug impaired inspection conditions.

Mac watched the lamps when he could, but on th few occasions when he chanced to catch an employe removing a bulb it was always to receive the water-tig alibi: "Just taking it out to clean it up a bit, Mr. Ma Snider," as the culprit would diligently wipe off th glass, polish away a few imaginary smudges with h sleeve, and then replace the bulb in the low-swingi socket.

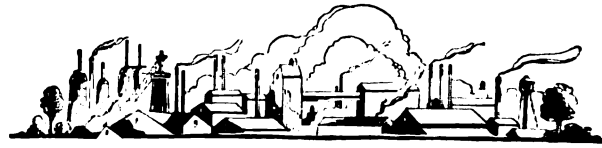
With the issue squarely up to him, Mac did some hea thinking, finally going to his superior with a plan whi was to keep both men at the plant throughout one Su day.

Monday there came the customary requests for replac ments, Tuesday fewer, and on Wednesday, none. Thur day two of the men even came around to admit sham facedly that they had discovered the missing lamps b neath their benches. And Mac never smiled.

The new lamps which had solved the pilferage proble soon earned the nickname of "red-wires" from the m on account of the feeble glow emitted on a 110-volt c cuit. They were simply 220-volt bulbs. Mac had mer juggled the terminals in the junction boxes to conv the usual 3-wire 110-volt circuits to 2-wire 220-v lines, and then replaced every bulb in the plant with th of the higher voltage—the new bulbs proving worse th useless in the men's homes, where it was shrewdly s pected that the missing units had found their way.

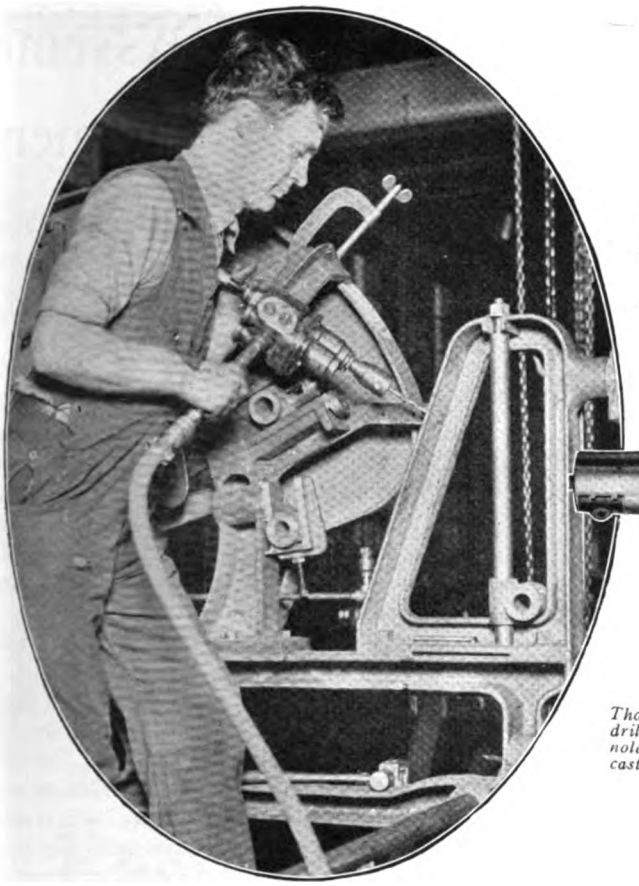
An interesting side-light on the lamp problem v afforded by the local electric light company, which ported an average light bill (for certain homes) to ma tain an increase of about 25 per cent. over figures of t years earlier—and these had gradually receded to alm their previous level as the high power lamps in the hom of the village burned out and must needs be replaced the subscriber's expense.

The simple expedient of boosting the lighting cir voltage saved this company the tidy sum of $240 on yearly light bills.



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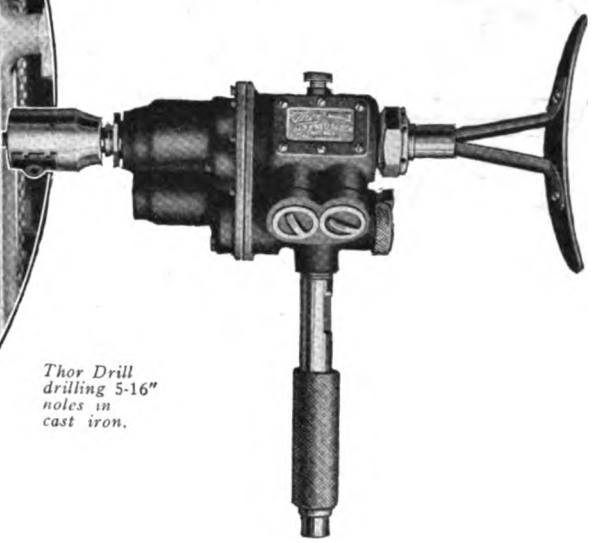
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Thor Drill drilling 5-16" holes in cast iron.

Thor

PNEUMATIC DRILLS



Built for Hard, Continuous Use

You'll never appreciate a Thor Pneumatic drill more than after the end of an exceptionally hard job. The way it eats up the work, quickly and efficiently, never stalling on the job, will make a hit with you.

Thor Drills are better drills. They are built to stand the "gaff." Study their construction—Corliss Valves—pressed venadium steel connecting rods and pistons—all parts are heat treated, fitted, ground lapped—none but "Thors" are built like this.

Thor Drills are cutting costs, setting records for speed and endurance in hundreds of plants. If you are not getting complete drilling satisfaction, give "Thors" a trial. You'll be convinced.

Let us send our latest catalog and literature—write today

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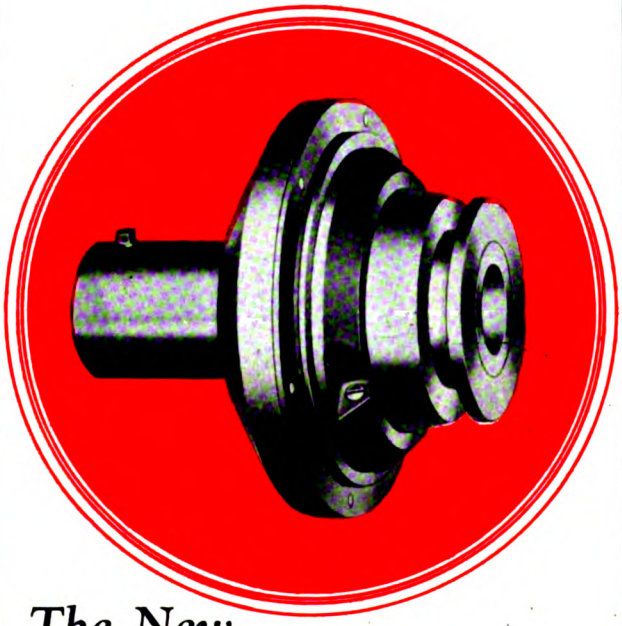
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The New

CONWAY
DISC CLUTCH

After many years of experimentation and tests, we have brought out the Conway Disc Clutch that has the following salient features:

1. The Clutch presents only a finished cylindrical contour.
2. There are no flying bolts, toggles, levers or pins.
3. The actuating parts are completely enclosed, yet the adjustment is handy and plentiful and clamps tight, being a simple split ring with a smooth finished surface.
4. The levers are alloy steel with a large factor of overstrength. Their under-slung position permits a large lever ratio which requires only slight pressure for engagement.
5. Centrifugal force would disengage the clutch when the cone is withdrawn, even if there were not springs forcing the plates apart. Vibration cannot cause the cone to withdraw, as this part is machined with a proper deflection angle.
6. A unique process of treating the key surfaces has practically eliminated wear in the splines.
7. The clutch is probably the quickest and easiest disassembled unit of its kind produced.
8. All discs are treated steel with woven asbestos lining, with ground faces as standard production.
9. The body of the clutch is counterbored to permit the pulley hub to extend under the point of frictional driving contact, which also saves considerable shaft space.
10. The clutch is inherently balanced.

We are ready to send descriptive matter and complete information.

THE CONWAY CLUTCH CO.
1960 Riverside ..i, Ohio

Progressive Assembly and Gang Payment

Industries Find This Method Practica on Large Output

By S. K. Hargis

(Personnel consultant)

THE progressive assembly of mechanical units wit payment on the gang basis, has been a failure in cer tain lines and a success in others. In theory, this for of assemblying mechanical units is the ideal one and thi is freely admitted by students of factory managemen But its failure in certain instances undoubtedly can b traced to faulty conditions in the plant and not to th principle of the thing itself.

In the automotive industries gang payment in conne tion with progressive assembly of motor cars and th sub-assembly of motor car parts has proved feasibl and this is perhaps due to the fact that production largely compared to many other lines. Probably the is no large factory in the country producing any quan tity of mechanical devices or units which doesn't some degree utilize the progressive assembly plan, but am dealing here with the final and general assembly wo —the completion of the job itself and not with su assembly.

The most practical method of handling final progre sive assembly of units on the gang payment basis i volves the utility of special conveyors which, in t case of heavy duty materials, must be quite extensi But the investment is worth the result if proper handli of the operatives engaged in final assembly work is a sured. In many factors I find that the gang payme plan is preferred by the workers. In others, their ea ings have been smaller and the output less dependable.

I have recently had opportunity to study at first ha the most successful progressive assembly gang paym operation in the country or at least one of the m successful. In this plant—producing a heavy househ appliance, sub-assembly work is done at the bench w a maximum number of operations per man. The fi assembly is completed on a 300 foot conveyor wh moves approximately one foot in a minute and wh is never stopped during working hours for any purp whatever.

The assembly of this cabinet begins at one end of floor-level conveyor and there is an operator every feet, each man performing one, two or three of ab 75 actions toward the final assembly. There is an spector at each 25 foot point and when a unit is reje for faulty workmanship or other cause, it is at once moved from the moving conveyor and returned to proper point for correction.

The payment for this entire assembly gang is b upon the number of units passed by final inspectio the end of the line, crated and shunted down a gravity cline to the shipping room.

The particular point about this system which has an unusual success in the plant lies in the attitud the personnel toward the system.

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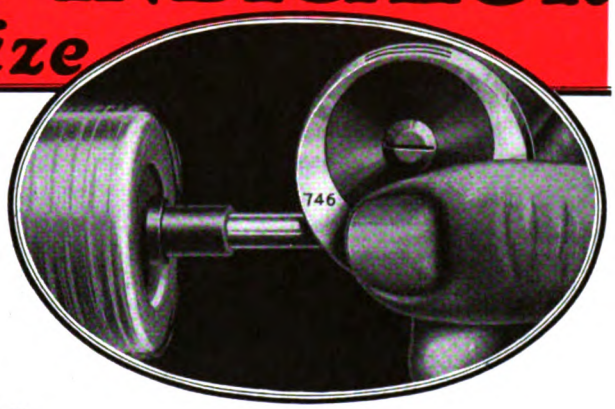
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B·S

A NEW SPEED INDICATOR
—Vest Pocket Size





Easy to Use
Counts like a pulse

Speed indicators have been made before—but never one like this. The size of No. 746 alone makes it different from any other such device. It slips into the vest pocket as easily as a watch. Light in weight—only 1½ ounces.



Counts the hundreds of R.P.M., beating them out like a pulse. Easy-to-read dials give direct readings up to 100—giving you exact R.P.M. at any speed.

No. 746 is simple in construction. Only four major parts. And into its manufacture has gone the skill that has made Brown & Sharpe precision tools famous for accuracy all over the world.

For such a quality tool the price is very moderate—including two rubber points—only **$1.50**

Shop officials, belt men, mechanics and time study men—those who are responsible for checking the speed of shafting and maintaining the R. P. M. of machines, need a device like Vest Pocket Speed Indicator No. 746. Get this Indicator from your hardware dealer. Also ask him for a Brown & Sharpe Small Tool Catalog. If he cannot supply you, write us direct.

BROWN & SHARPE MFG. CO.
Providence, R. I., U. S. A.

BROWN & SHARPE TOOLS

"World's Standard of Accuracy"

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Screw "LENOX" Drivers



Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

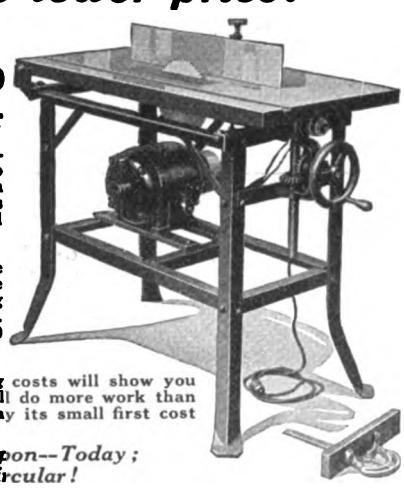
Points are heat treated to stand the strain without bending. And the handles cannot loosen.

Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

AMERICAN SAW & MFG. CO.
Springfield, Mass.
"The Tools in the Plaid Box"

Parks shipping room saw *at a lower price!*

was $75.00
NOW $60.00
without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon--Today; for circular!

The Parks Woodworking Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

FILL OUT AND MAIL THIS COUPON—NOW!

I. I.
The Parks Wood-Working Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.
You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.
Name .....
Firm Name .....
Address .....
City..... *State*.....

Previously, in this plant, assembly was done at the bench by means of both trucks and limited conveyor systems but increased output demanded a method of speeding up the final assembly which continuously lagged behind production of parts.

With unit assembly on the progressive gang payment basis entirely, every man has an identical interest in keeping the line moving and in keeping the crated units passed inspection, and onto the shipping room floor.

I questioned a number of the operators on this job and every one of them said he preferred the progressive plan and the gang payment as it made for better team work, a uniformity of department operations and a proportionate return in wages to the day's output.

Each statement was qualified, however, by some such observation as this:

"I am against the gang payment plan unless the shop is organized completely for it. The thing has to be tuned up or one department or one man suffers for the incompetency of another. In this shop the foreman is compelled to call for more men if his particular assembly operation slows up the line. This means that we can maintain speed enough to insure a fair wage for the day's work."

With many manufacturers with whom I have had dealings, there is the belief that the men object to the gang payment plan. In nearly every instance the superintendent admits that there have developed weaknesses in the management of the plant or in the handling of the product which made for an uneven effort along the line, and that the management had failed to provide for the strengthening of weak points on short notice by means of reserve help.

In the average factory assembling heavy mechanical units—such as washing machines, refrigerators, etc., there are always slack hours in fabricating departments when labor can be instantly diverted to progressive assembly conveyor work as weaknesses on the line develop. This would seem to meet the chief objections of the operators doing assembly work continuously. Of course, there must be room for additional workers on any operation that is too slow for the balance of the line; workmen are employed on the basis of a certain speed of movement for the assembly conveyor and it is obviously unfair to permit a slowing up of the conveyor. This reduces the number of crated units delivered in an hour to the shipping room and the reduction of the pay of every man in line.

Factory executives with progressive assembly propositions will find, without question, that the gang payment basis on all operations which permit are superior in every way to piece work methods, providing every precaution is taken to secure adequate inspection at needful points and to provide pinch-hit labor when certain actions in the assembly slow up.

I was impressed in the factory mentioned by the earnestness with which each man on the final assembly line kept at the man behind him for more speed which during peak production periods, increased the output automatically.

With the use of the floor level conveyor in final assembly work, the plant can determine its output for the day in advance and also force an increase by speeding up the belt if the force can through greater effort keep up with it. This means, of course, that inspection has to be equal to the task.

For pr... ...n this issue write Industry Illustrated

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Now watch his worries roll away on Bassicks



Maybe he did save money on his casters— but look what he paid for his economy—

(a) damaged goods
(b) damaged floors
(c) broken down trucks
(d) broken down casters
(e) loss of time
(f) expense plus—

How easily it rolls on Bassicks

Your caster worries have been anticipated by Bassicks

THE production of Bassicks is a deliberate effort to produce a caster of outstanding quality—performance—and worth.

No rule of "pinch penny" is ever applied to Bassick research—Bassick experimentation or Bassick manufacturing.

The result is a caster that rolls easily—turns easily—starts easily—always. Bassicks are smooth rolling—quiet—safe—sturdy—certainly efficient and economical.

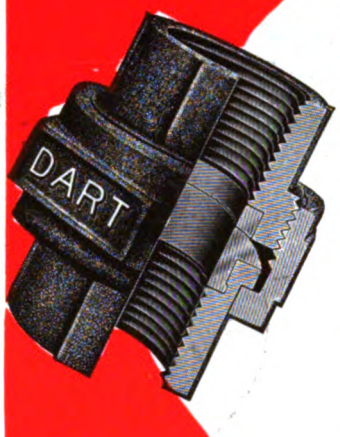
Bassicks are worth knowing better. May we send you a copy of Catalog F-104?

Bassick Casters
Reg. U. S. Pat. Off.
The BASSICK COMPANY
(A Division of Stewart Warner)
BRIDGEPORT, CONN.

For thirty-one years the leading makers of Better Casters for home, office, hotel, hospital, warehouse and factory.

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Try Them—Free



It costs you nothing to try DART Unions and convince yourself that they stay tight always.

Have us send you one, or two if you wish, put them anywhere you think best and then decide for yourself.

DART Unions have Bronze seating surfaces, ground to an absolute tight seating ball and socket joint. This makes them leakproof. Besides every DART Union is guaranteed—two for every one found defective.

Send for your free sample.

E. M. DART MFG. CO.
Providence, R. I.

Sales Agents
The Fairbanks Company
New York

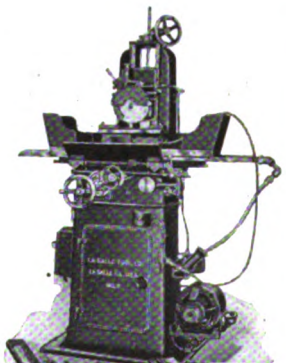
Canadian Factory
Dart Union Co., Ltd.
Toronto Canada

DART UNIONS

La Salle No. 2 Automatic Surface Grinder

This machine is particularly efficient on a wide variety of small tools. It is indispensable for grinding dies and punches and finishing bright true surfaces and parts of tools, instruments, etc.

Ease of operation, unusual rigidity, preserved alignment and long life are leading characteristics of this profitable tool.



Capacity
20"x6"x10"
24"x6"x10"

Also Manufacturers of

No. 1 Plain and Surface Grinders.....$115.00
No. 2 Automatic Surface Grinders..... 550.00
No. 3 Plain and Surface Grinder..... 365.00
American Twist Drill Grinders..Price $120 to $350
All prices F. O. B. La Salle, Illinois

May we send you full particulars?

LA SALLE TOO[illegible]ANY
OTTAWA, La Salle Co[illegible]

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In this particular plant there is a process of weeding out naturally slow workmen where they deserve it, putting them to other jobs on piece work. The result is that the final assembly in this shop is gradually tuned up to a high pitch of efficiency and the output and the earnings of the gang have been steadily increased day by day. The least unevenness in the speed with which various operations are performed will, of course, cause a lot of jamming and trouble which may at times disorganize the whole line and cut into the day's output.

To avoid this there are two foremen on the line who constantly check up and watch each operation, and where there is a jam threatened there is an immediate call on the superintendent for additional men. In those operations which call for special knowledge and skill, operators in other parts of the plant are kept in reserve trained to the assembly job. In those operations which are simple and call for no special skill, any intelligent production department mechanic serves.

Nothing can prevent the principle of the progressive assembly and gang payment becoming more firmly established in these branches of industry which can use it. Where the men seem to disfavor it, there usually is some cause which is removable. The weak points in the system reflect themselves in the attitude of the men along the line and when the weak spots are remedied and strengthened, the men are glad to work on the gang basis.

The automotive industries have gone too far in the way of progressive assembly and gang payment to leave any doubt in the minds of other manufacturers of its entire efficacy. It is merely a question of careful adaptation and handling.

Steam Turbine Operates at 1,200 Pounds Pressure

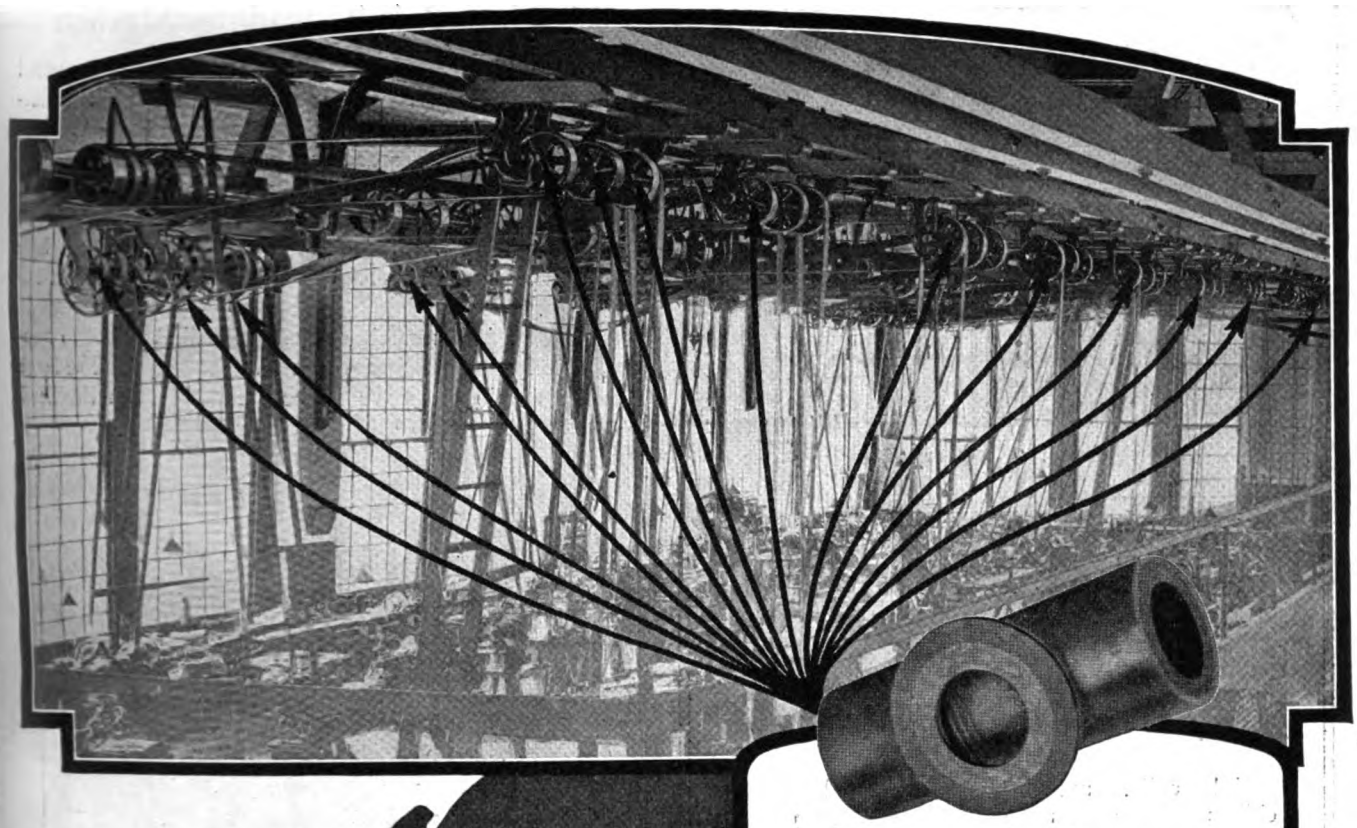
THE Milwaukee Electric Railway and Light Company has started operation of a steam turbine generator which uses steam at a pressure of 1,200 pounds between three and four times the average pressure of today's generating plants and, with one exception, double the pressure in use in any station. The one exception is the 3,000-kilowatt turbine-generator in the Edgar station of the Edison Electric Illuminating Company of Boston, which also operates at 1,200 pounds pressure. The Milwaukee machine sets a record, however, in that it has a capacity of 7,000 kilowatts, more than twice that of the Edison unit. Both are of General Electric design and manufacture.

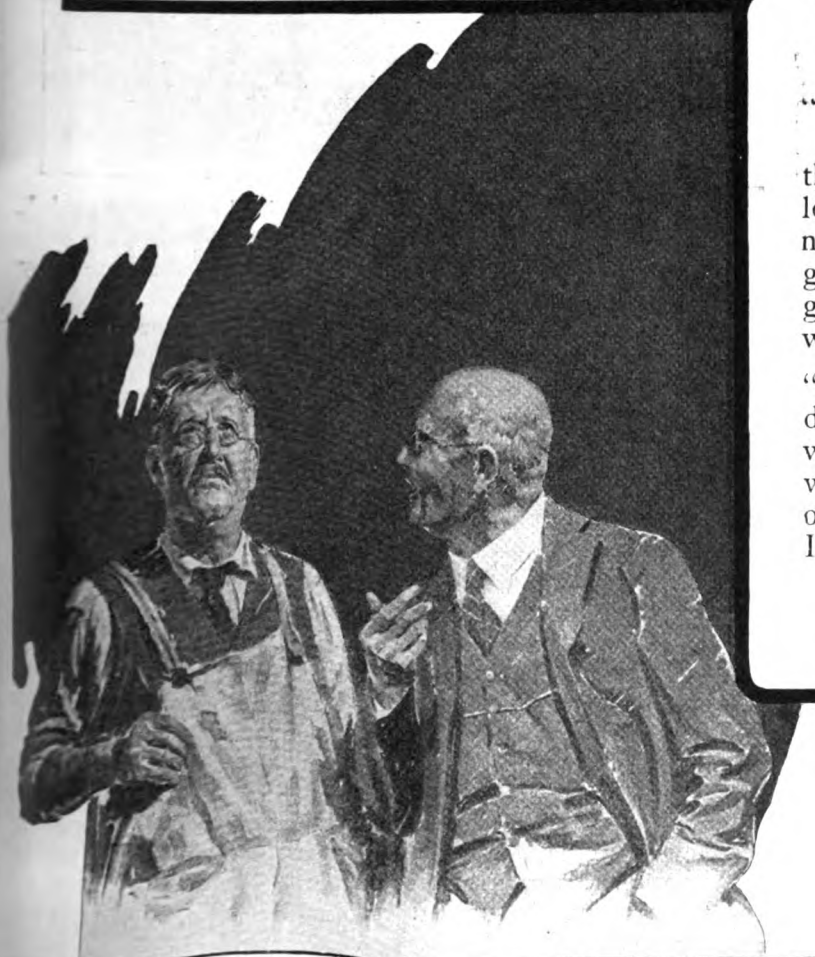
The Milwaukee turbine receives steam at a pressure of 1,200 pounds a square inch, superheated to 720 degrees Fahrenheit. It exhausts at 320 pounds pressure, the steam being conducted at this pressure to the station mains serving several 30,000-kilowatt machines where more of its energy is extracted. Final exhaust is at one inch absolute.

Until ten or fifteen years ago turbine steam pressures, especially in American power stations, were little higher than those commercially in use in high-grade pumping stations at the end of the nineteenth century, but there has been a marked trend toward higher pressures and temperatures in order to take advantage of the increased economics thereby made available.

A pressure of 400 pounds is now common in central stations. Six hundred pounds is, however, the maximum except in the cases of these two 1,200 pound machines

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"YES, SIR—those Arguto Bearings have been on those countershafts almost as long as I can remember. We've never touched them—never given them a drop of oil. I guess they'll be there after we're gone.

"Somebody told me the other day about an Arguto Bearing which had run for 22 years with no sign of wear to shaft or bearing. Some record, but I guess ours will match it!"

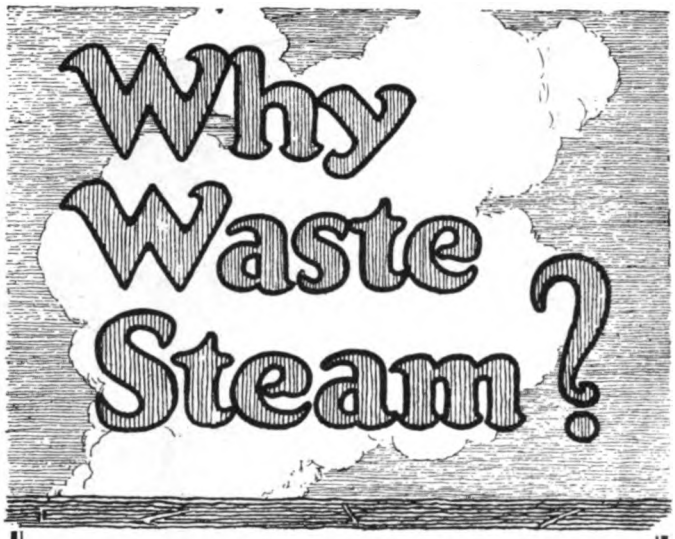
Are YOU interested in bearings that will give such service? Write us.

ARGUTO OILLESS BEARING CO.

Wayne Junction, Phila., Pa.

Arguto OILLESS BEARINGS

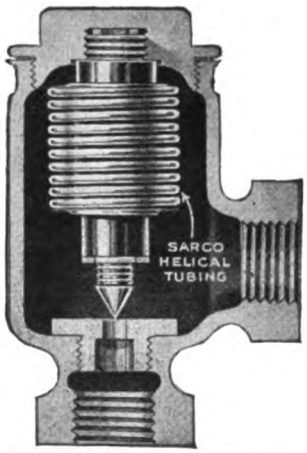
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Save it with

SARCO STEAM TRAP

All coils, machines and process apparatus must be trapped right at the outlet. Otherwise there is a waste of anything up to 200° F.—the difference between live steam and condensate.



Mains must be trapped "early and often" to get real operating economy and efficiency.

Sarco Steam Trap No. 9 makes this possible where large, cumbersome traps make adequate trapping prohibitive either because of first cost, installation cost, or the complexities of position.

Sarco Steam Trap costs one-third the price of heavy traps for equal capacity. It goes anywhere a pipe goes—screws in like an elbow in an upright position. No platform, pit or supports needed.

Sarco Steam Trap has only one moving part. It is positive in action and requires no attention. Opens when steam is off and automatically closes when steam comes on—can't freeze or air bind.

It is self-adjusting from 0 to 100 lbs.

Let us send you a Sarco on 30 days' free trial. Write for full particulars and Booklet R-284.

SARCO CO., Inc.

183 Madison Ave., New York

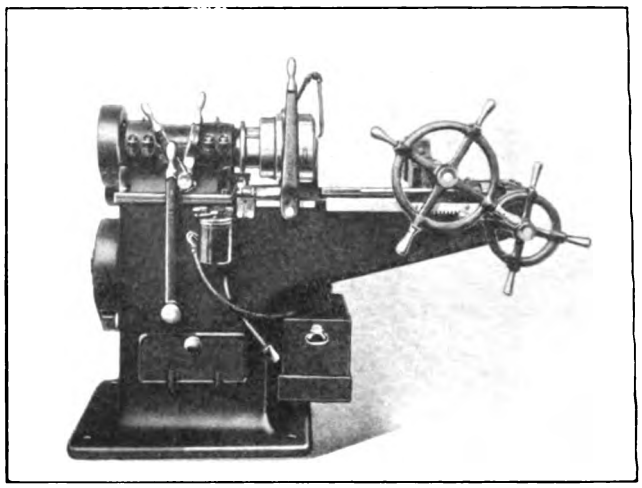
Boston Chicago Detroit
Buffalo Cleveland Philadelphia
Peacock Bros., Ltd., Montreal

A New Bolt Threading Machine

A BOLT threading and cutting machine of the geared head type particularly designed for high production, has just been placed on the market by the Williams Tool Corporation of Erie, Pa., after several years of experiment and test in actual use.

The machine is very compact, follows the modern trend of machine tool design by having the motor at the base instead of above, and has many new and important advantages.

This new bolt machine uses large die-holders to support small renewable dies of high-speed steel. The large die-holders do not have to be removed from the head in order to change dies.



Neither is there any special head adjustment needed except for the actual fitting of the thread that is to be cut. The size of the thread desired is taken care of by the length of the dies.

To cut a different size thread, the operator can quickly change dies, simply by loosening the locking screw and taking the die from the holder.

Simple Control, By Two Levers

The operator has complete control of the machine from one position, and can get seven different speeds by operating only two levers.

To change gears it is only necessary to ease out on the clutch, which permits the placing of one or both gear shift levers. A speed plate back of the levers gives the correct position for each size of bolt.

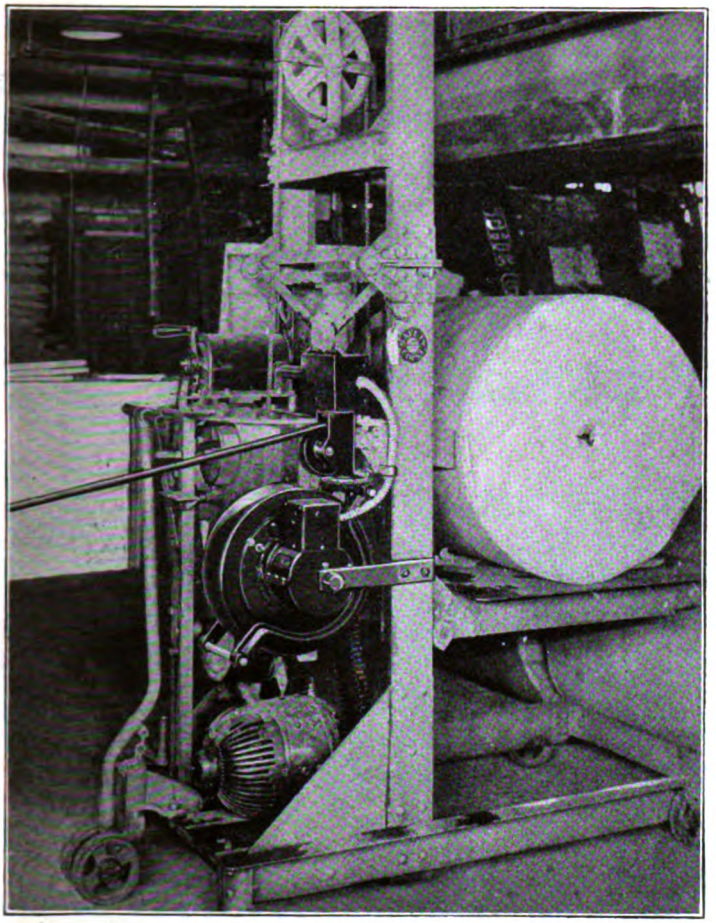
Another outstanding feature of this new bolt machine is the simplicity of the automatic die head. The several parts—die head, die head support, cam, cam ring, die holders and shell—are all enclosed, forming one compact unit.

The shell, which is controlled by compression spring, travels backward and forward on the die head and in turn opens and closes the dies. The head is adjusted by pulling the lever forward, and is released by a trip rod adjusted in the carriage.

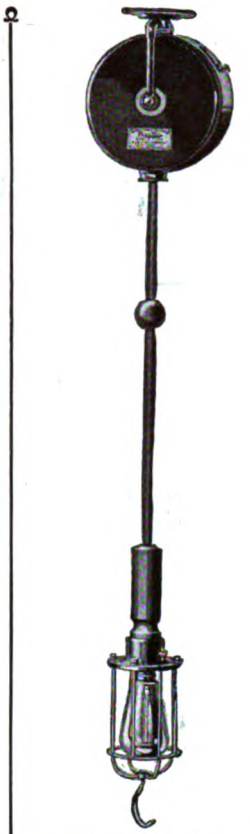
This trip rod can be set to give any desired length of thread within the capacity of the machine. The dies are adjusted by releasing the cam ring from the shell. A spanner wrench engaged in the cam ring is moved backward or forward in order to give a larger or smaller adjustment, for the size of thread to be cut. The cam ring is then locked to the shell, holding the die-holders in a fixed position.

Products not advertised in this issue write Industry Illustrated

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Constant Duty Reelite with Swivel Cable Outlet as used in connection with electrically operated portable elevator made by Economy Engineering Company, Chicago, Illinois.



Reelite
REG. U. S. PAT. OFF.

The handy light on a reel
For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connector in place of light so that it will furnish current for small machinery, and portable drills, etc.

Portable elevator made far more useful through Reelite

Where electrically-operated machinery must be *portable*, must move about during operation, nothing promotes efficiency and convenience like Reelite.

For Reelite carries current wherever it's needed—to travelling cranes, lifting magnets, boring mills, portable hoists and mobile transfer cars.

The menace of bare rails and wires is eliminated. The clumsiness of trailing cables lying about is abolished. Cable is payed out and retrieved just as needed, never too little nor too much, no slack, no undue tension, no appreciable wear.

Often a Reelite pays for itself in cable renewals *alone* the first year. If a man has been employed to tend cable, he can be used elsewhere. Reelite is a very real economy, always.

Send for this new, profusely-illustrated bulletin just off the press. It will point the way to operating economies you have never known before.



APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue, Chicago, U. S. A.*
New York—150 Varick St. Los Angeles—340 Azusa St.

CONSTANT DUTY
Reelite
REG. U. S. PAT. OFF.
Carries Current Where Needed

APPLETON ELECTRIC CO.
1716 Wellington Ave., Chicago

Gentlemen:

Please send us a copy of your new Bulletin 501-S
This obligates me in no way.

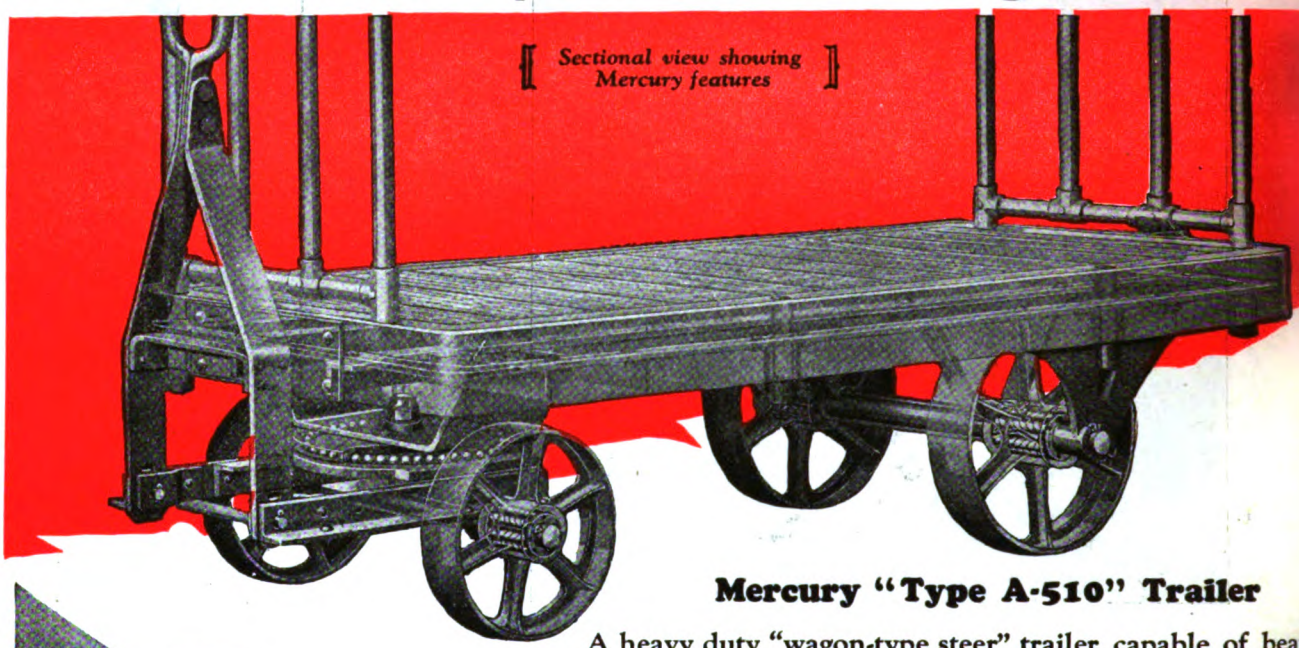
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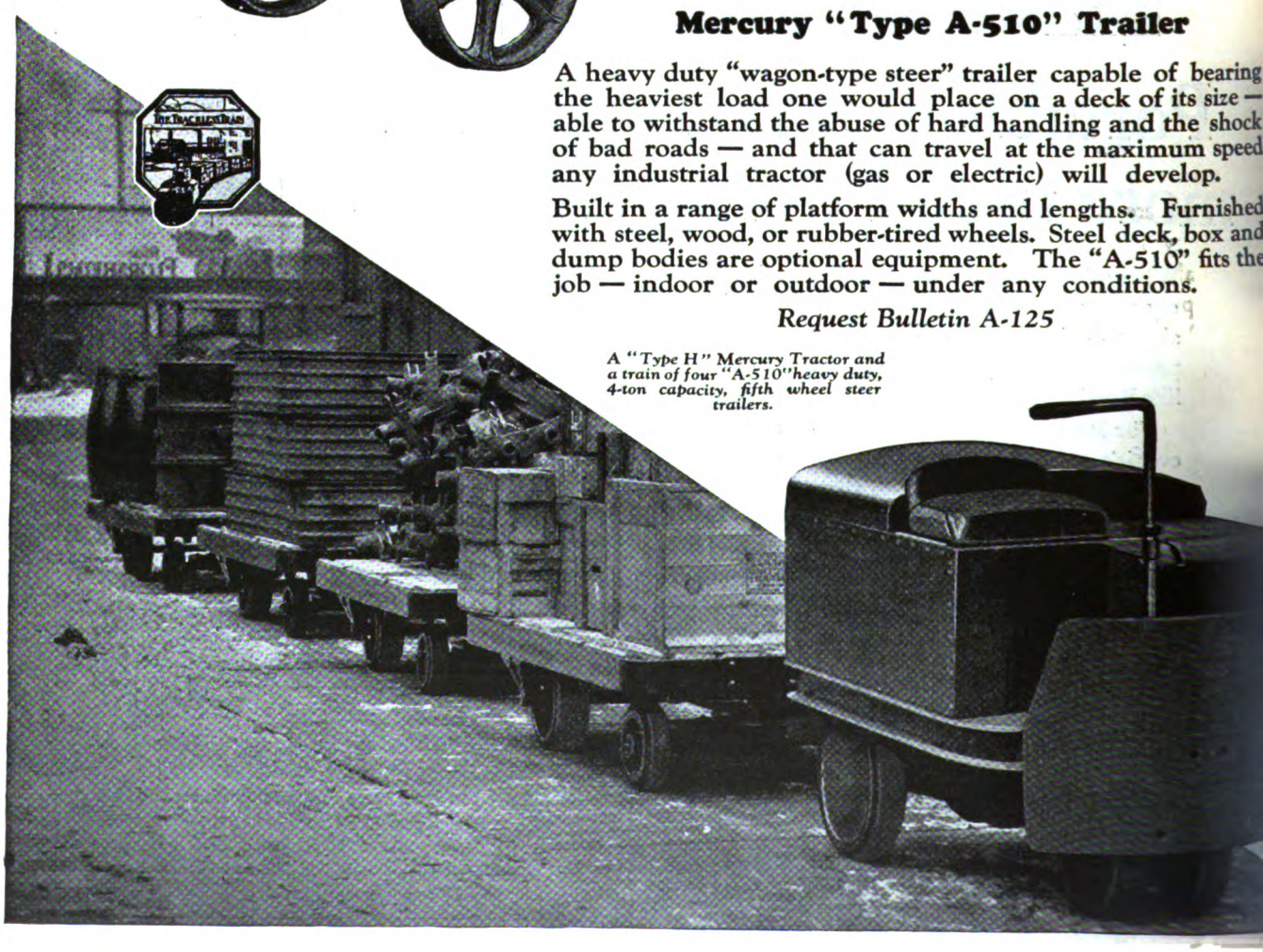
Sectional view showing Mercury features

Mercury "Type A-510" Trailer

A heavy duty "wagon-type steer" trailer capable of bearing the heaviest load one would place on a deck of its size — able to withstand the abuse of hard handling and the shock of bad roads — and that can travel at the maximum speed any industrial tractor (gas or electric) will develop.

Built in a range of platform widths and lengths. Furnished with steel, wood, or rubber-tired wheels. Steel deck, box and dump bodies are optional equipment. The "A-510" fits the job — indoor or outdoor — under any conditions.

Request Bulletin A-125



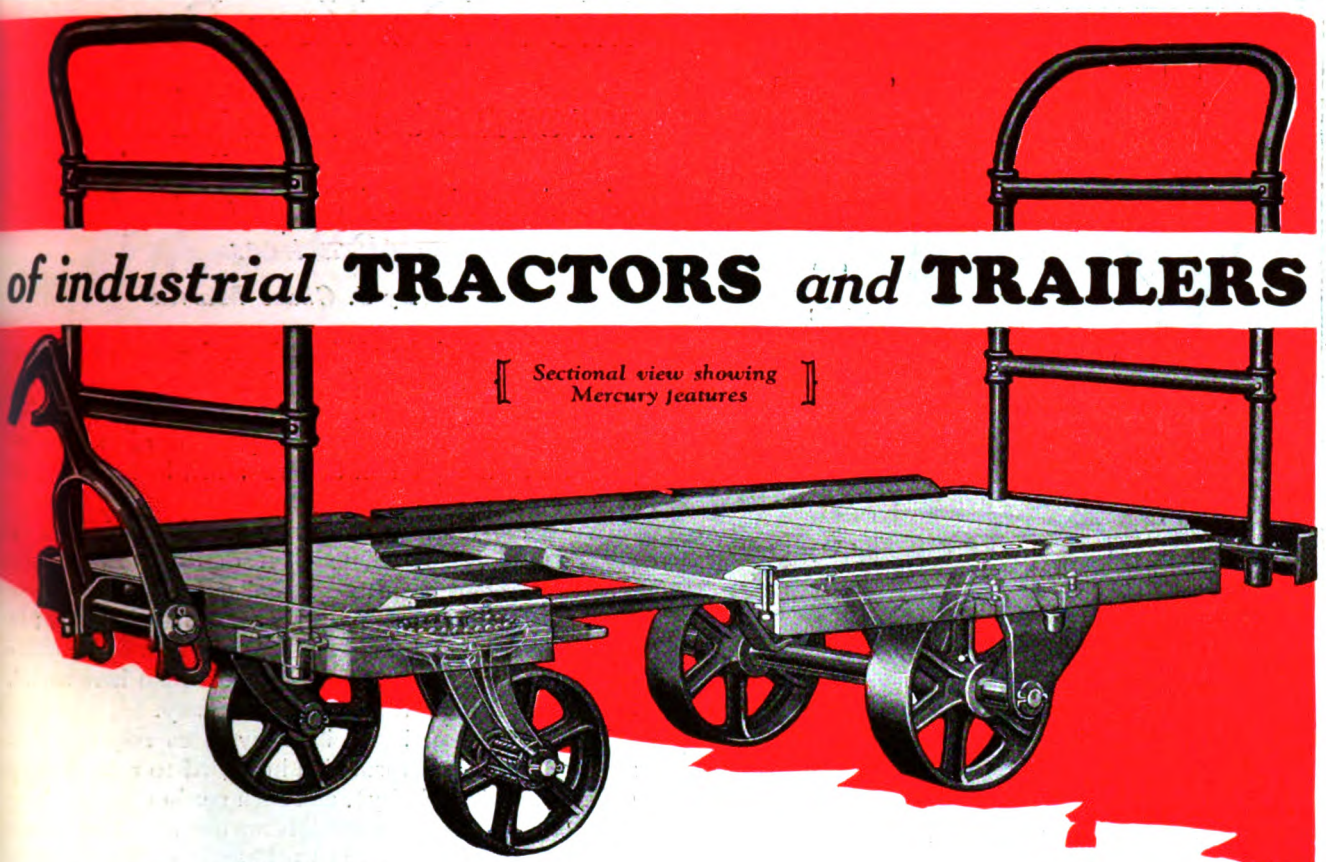
A "Type H" Mercury Tractor and a train of four "A-510" heavy duty, 4-ton capacity, fifth wheel steer trailers.

Mercury Manufacturing Company

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of industrial TRACTORS and TRAILERS

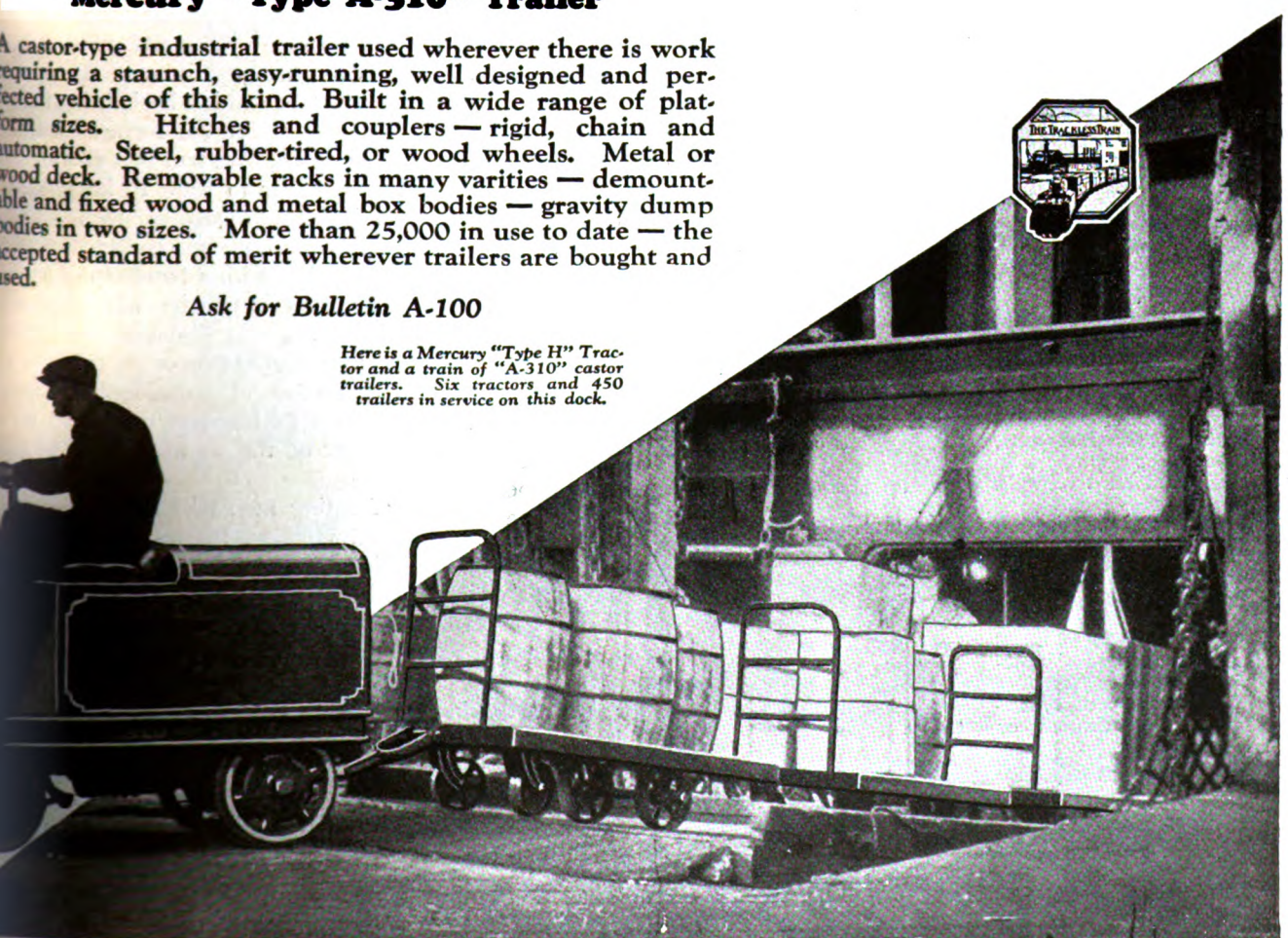


[Sectional view showing Mercury features]

Mercury "Type A-310" Trailer

A castor-type industrial trailer used wherever there is work requiring a staunch, easy-running, well designed and perfected vehicle of this kind. Built in a wide range of platform sizes. Hitches and couplers — rigid, chain and automatic. Steel, rubber-tired, or wood wheels. Metal or wood deck. Removable racks in many varities — demountable and fixed wood and metal box bodies — gravity dump bodies in two sizes. More than 25,000 in use to date — the accepted standard of merit wherever trailers are bought and used.

Ask for Bulletin A-100

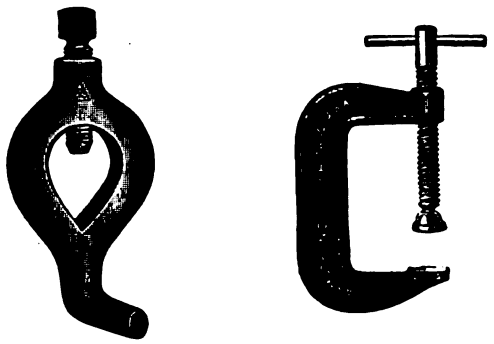


Here is a Mercury "Type H" Tractor and a train of "A-310" castor trailers. Six tractors and 450 trailers in service on this dock.

112 So. Halsted St.—Chicago, U.S.A.

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DOGS AND CLAMPS

Drop forged from a special grade of open hearth steel which combines exceptional stiffness and tensile strength. The screws are made from alloy steel and are hardened on the point. Hubs large enough to permit retapping. There is an ARMSTRONG Lathe Dog or Clamp for every machinist's purpose. Write for free descriptive literature.

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"The Tool Holder People"
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Floors slippery?

ARE your floors slippery—soaked with oil or grease, embedded with dirt or fine dust, that makes them hard to clean and hard to walk on?

If so, wash them with OAKITE. It is the one safe, dependable way to remove grease, oil and dirt, quickly and completely. OAKITE cleans all floors thoroughly, whether of wood, composition, terrazzo, tile, cement or concrete. And does it safely. For OAKITE contains no soap, caustic, acid, abrasive or any other substance that is harmful to floors in any way.

Send for special cleaning booklet relating to your work. It gives full directions for washing floors, as well as practical suggestions for improving all of your cleaning. A post card request will do. Write today.

Oakite Service men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

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OAKITE PRODUCTS, INC., 40A Thames St., NEW YORK
(Formerly OAKITE CHEMICAL CO.)

OAKITE
Industrial Cleaning Materials and Methods

How Do You Rate and Promote Employees?

A Discussion of Some of the Common Practices

By S. Chase Martin

JUDGING of the ability of employees in a large organization is becoming an increasingly difficult problem, and yet one of first importance. The fact that a department is running smoothly is not of so much importance as the question of how much better could it be run.

When the foreman or office executive is in effect an employment agent, whose chief duties are to transfer men to different departments and to lay off those whose records do not seem to justify their being kept on; he must rely upon information furnished him by the different department heads under whom the men have worked in estimating their value to the company.

The department heads in many cases rely upon their section heads for information in regard to a man's ability (oftentimes desirability), and such section foremen being as a general rule promoted from the ranks on account of their knowledge of the work, their experience in the matter of judging a man's worth from any other point of view than that of their own is sometimes quite limited.

A man who has been rated as unsatisfactory in one department, in many cases has opinions of his record passed on to the department to which he is being transferred, for it is human nature for the former employer to seek vindication of his judgment, and it is also human nature for the future employer to want to know something of the man who is going to work for him.

In this way a man who has been unsatisfactory in one department may enter another with a handicap of prejudice, which, unless he comes in contact with some one big enough and broad enough to discover any hidden talent he may possess, may find his curve on the chart in the chief's office to be taking on a decidedly drooping characteristic, and as soon as business conditions warrant, his name will appear on the list of those to be laid off.

Present methods of rating men take little account of human nature and individuality, the tendency being to consider a man's ability from the standpoint of a set of questions which take into account results but not cause, in fact performance is rated much the same as that of a machine in which the human element is left out altogether.

The following question often appears on personal rating forms: Is he a clock watcher?

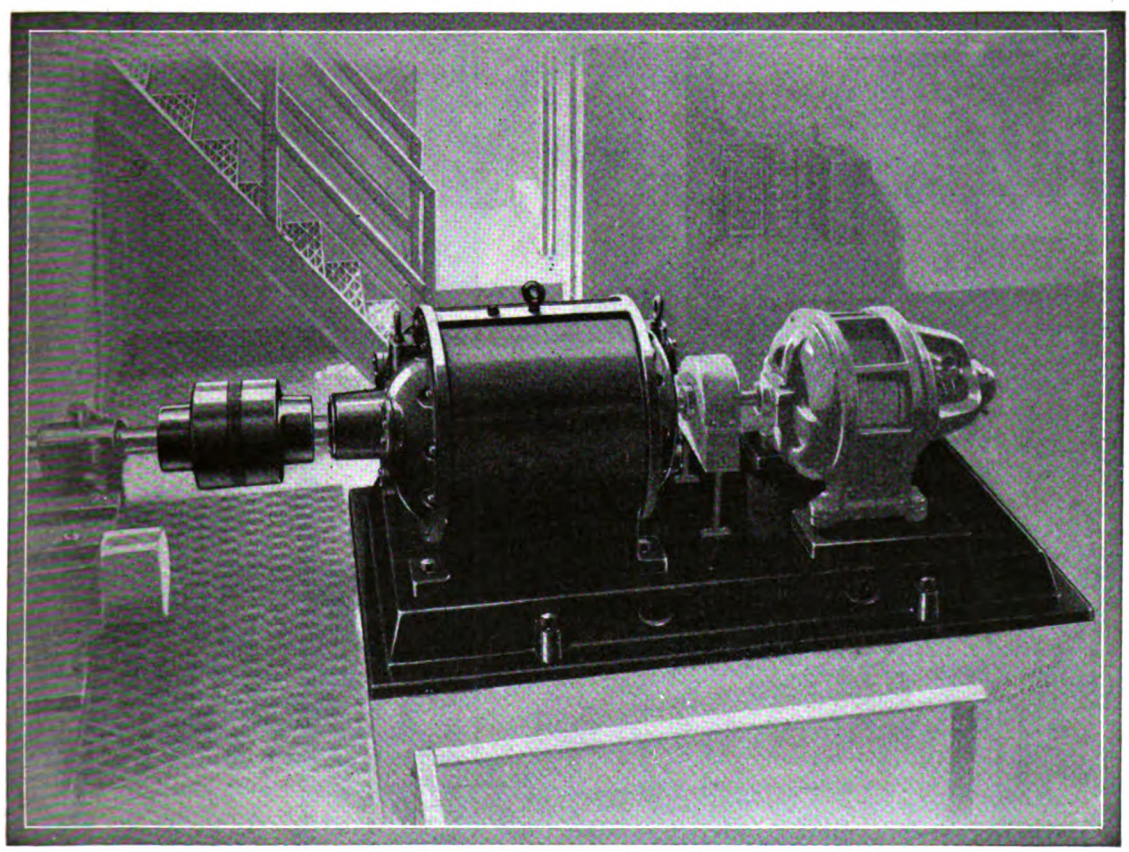
I know of no bearing which such a question could have on a man's ability to do good work and lots of it. If he can watch the clock and quit on the minute and at the same time turn out a good day's work it is no discredit to him if he keeps track of the passing time. If he becomes so interested in his work that he becomes absorbed in it and forgets to glance at the clock it is no credit to him. On the contrary, if he has little to do and it is routine work that calls for no special time for comp

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Ideal Operating Conditions

are characteristic of these Reducers

Here is a typical installation of a Jones Spur Gear Speed Reducer. Power is transmitted on a balanced straight line. The necessary reduction in motor speed is obtained in small space. The gears are inside the dust-proof housing and operate in an oil bath—perfectly lubricated at all times. Danger of injury to workmen is eliminated. The only attention required is an occasional replenishment of the oil supply. The reducer and motor are mounted on the same base, furnished by us, which insures against misalignment of motor and high speed reducer shaft. Under such ideal conditions it is easy to understand why Jones Spur Gear Speed Reducers transmit maximum power at minimum cost. Write for Catalogue Number 26.



Jones Speed Reducers

W. A. JONES FOUNDRY & MACHINE COMPANY

Main Offices and Works: 4412 West Roosevelt Road, Chicago

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Paint by machine—save the cost of hand brushing. The difference will surprise you.

Own your own spray painting outfit. Any man in your plant can quickly learn to cover 1000 square feet and over per hour with the easy-to-operate Binks Spray Gun. Once you own a Binks Spray Painting Outfit, your entire business establishment will be frequently refinished both inside and out. You will protect your property investment for all time.

Owners of factory and office buildings, hotels, hospitals, schools;—builders, contractors, etc., are finding the Binks Spray Painting Outfit the best paying investment in their maintenance departments.

Here is a one time investment that will pay for itself the first year and save you 60% to 80% of your painting costs for years to come. Further interesting details will be cheerfully mailed upon request. Write today.

BINKS SPRAY EQUIPMENT COMPANY

Dept. D, 3133 Carroll Ave., Chicago

Offices in Principal Cities

ESTABLISHED 1898

tion, or if his duties compel him to sit and wait, he can not be blamed for watching the clock.

The sin of clock watching, if it is a sin, should be considered with reference to the class of work on which a man is employed.

Another question often asked is: "Does he cooperate? I have yet to find a man that could not be gotten to cooperate provided that he was normal mentally and was not influenced by some friend higher up.

What should be known about a man in addition to what he is reported as doing or not doing, is why he is doing or not doing it. Is it the fault of the man or the fault of the department. If many men pass through a department rated N. G. the department should be investigated regardless as to whether these men did or did not make good in previous departments. It may be that they are being passed along on their previously reported reputations.

At the same time it should be recognized that if a section head is to be responsible for his work he should have the choice of his men but his judgment of a man should not always be taken as a criterion of such a man's potential worth to the company.

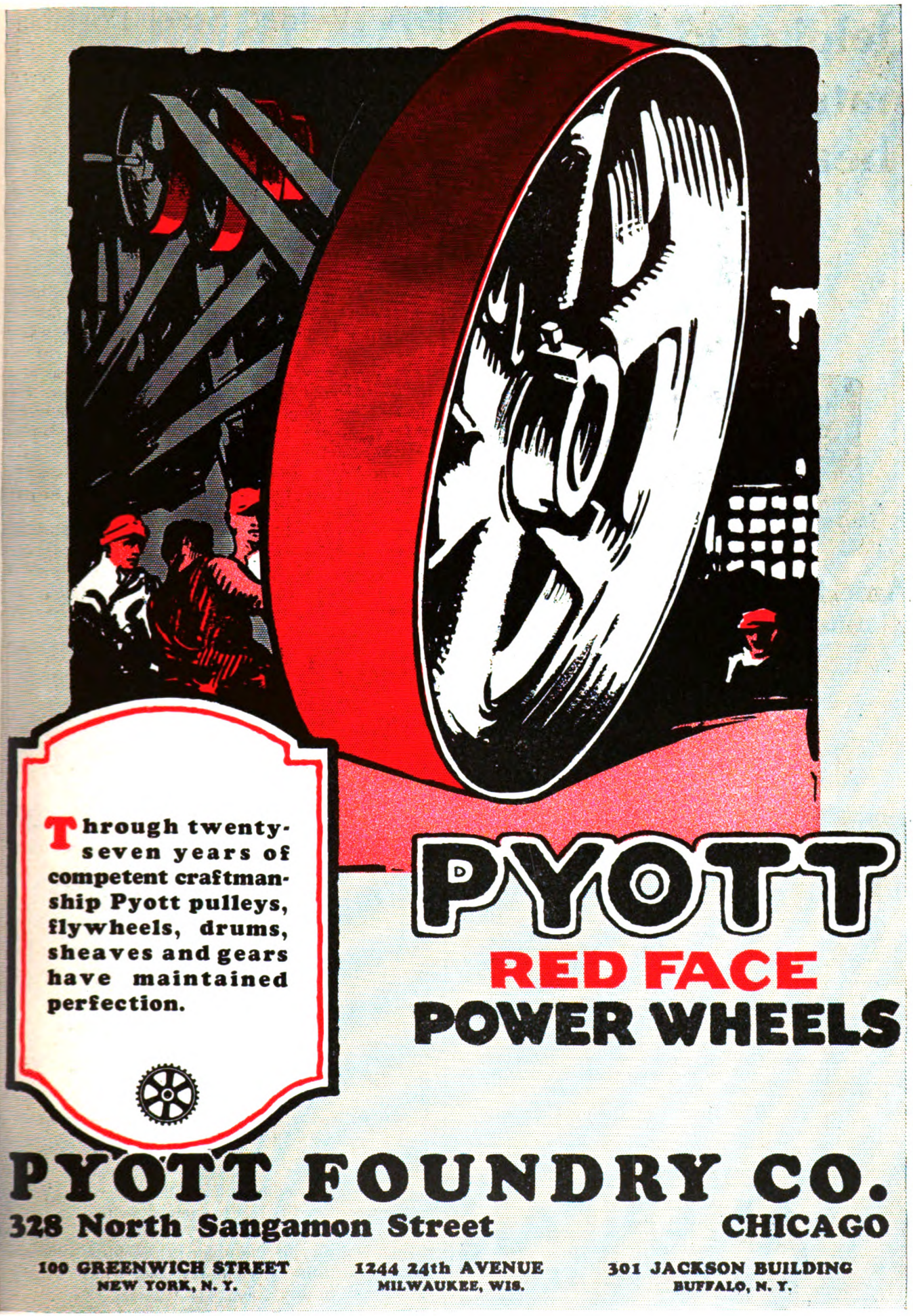
Perhaps the worst offender is the chronic knocker, one who criticizes everyone and everything; but even this individual need not be considered hopeless, for if the foreman is of a type to command the respect and loyalty of his men the chronic kicker is usually taken care of by his fellow workers and unless he is very hard boiled may turn to be an enthusiastic worker.

The first principle in the successful handling of men is to give responsibility and trust. In other words, let him drive his car and keep your hand off the steering wheel. A knowledge of human nature is essential for leadership, not of your nature but of the nature of others. Too many foremen stress too much their own lives and experiences, their likes and dislikes. Few men are interested in these, they have their own. They also have their own opinions of what they want to do and what they ought to do.

Curves and cross section paper fail miserably when the men whose ability they are supposed to represent come under the influence of a leader with a broad knowledge of men and who has the character and reputation to command their respect.

This does not apply to the mentally inactive of whom there are often far too many in the large manufacturing plant. Such men are cheap, and they do the work as it is set before them but they make no improvements in methods on their own initiative and are an expensive investment in the long run.

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Helping to build the nation's health!



"American" Pulleys in the world's most famous soup kitchens

THE best thing about Campbell Soups is that they are *good*. On that fundamental of worthiness rests their popularity. Advertising keeps the name before the public, but the combination of factors that renders them so uniformly well made is the keystone of their success.

These factors extend through an amazingly complex array of steps and processes down to the last detail of mechanical equipment that will help maintain the Campbell standard.

For years "American" Steel Split Pulleys have been used by the Campbell Soup Company because of their dependability as efficient power transmission units. Their great strength with light weight impose no unnecessary load upon the shafting; their crowned rim grips the belt firmly; arms cut the air instead of fanning it; and these pulleys run true and can be installed quickly without stripping a busy line shaft (because of the split design).

It is doubtless, too, for these reasons that millions of "American" Pulleys are used by industrial plants all over the world. Send for special folder.



PATENTED

"American" Pressed Steel Shaft Hangers are light, rigid, efficient and adjustable. Their strong, tubular design adds to the good appearance of any shop.

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Avenue Philadelphia, Pa.

For nearest distributor see Mac Rae's Blue Book

AMERICAN PRESSED STEEL HANGERS PATENTED | AMERICAN STEEL SPLIT PULLEYS PATENTED

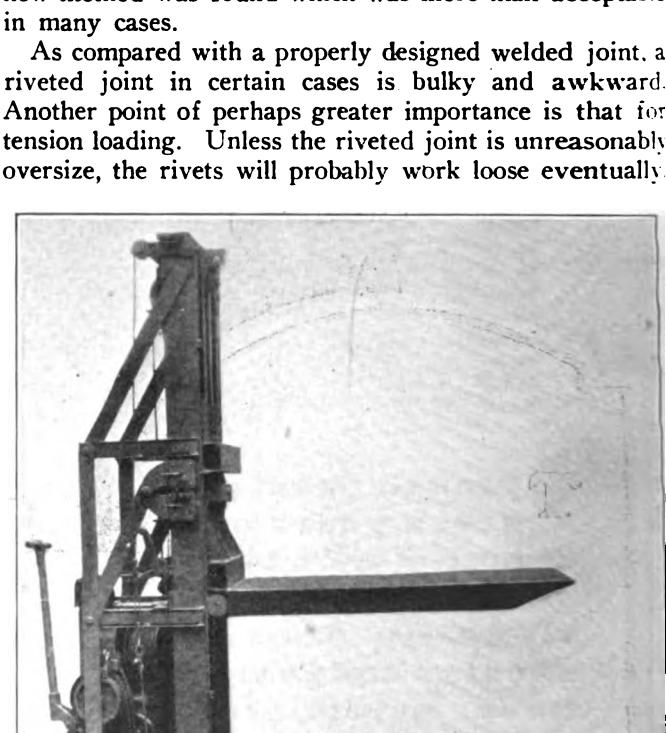
A Welded Steel Portable Elevator

By R. E. Kinkead

THE equipment illustrated is an excellent example of the use of welded steel construction in place of castings and riveted construction. Twenty-five years ago, equipment of this class would have been made largely of castings. Ten years ago the equipment would have been made of structural steel riveted together.

The changing mechanical practice in this case is typical of the progress being made in mechanical construction. Castings were heavy, breakable and expensive, therefore, prior to the spread of knowledge regarding welding, riveted steel was used. Steel being stronger and more rigid for the same section than cast iron was an attractive material of construction to the engineer. From the economic point of view, steel offered equal strength at far less cost. The only means available for fastening pieces of steel together to form the equivalent of a casting were rivets or bolts. With the coming of welding, a new method was found which was more than acceptable in many cases.

As compared with a properly designed welded joint, a riveted joint in certain cases is bulky and awkward. Another point of perhaps greater importance is that for tension loading. Unless the riveted joint is unreasonably oversize, the rivets will probably work loose eventually.



A 5,000 lb. capacity portable elevator made almost entirely welded steel shapes and plates.

The welded joint will remain permanently tight i definitely. Many designers make the welded joint strong and stiffer than the sections joined so that failure w never occur in the joint. This makes available t normal elasticity of the original unwelded sections a gives the structure a lasting resiliency which is regard as desirable in many cases.

Welding may not be economically applied as a su

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Industry lives by Profit!



A Richardson Automatic Dustproof Scale to determine the quantity of bulk Soda Ash and Bicarbonate of Soda produced.

Used by
SOLVAY PROCESS COMPANY
PITTSBURGH PLATE GLASS CO.
MICHIGAN ALKALI CO.
J. B. FORD CO.
DIAMOND ALKALI CO. ET AL.

The profit of most industries depends on Correct weight—of incoming raw material—of material in process—or correct weight of material produced and shipped. Profit is greatest in those industries where essential processes are performed at least expense; i.e., automatically.

RICHARDSON AUTOMATIC SCALES

for

bulk weighing or sacking loose materials **protect the profits of industry.**

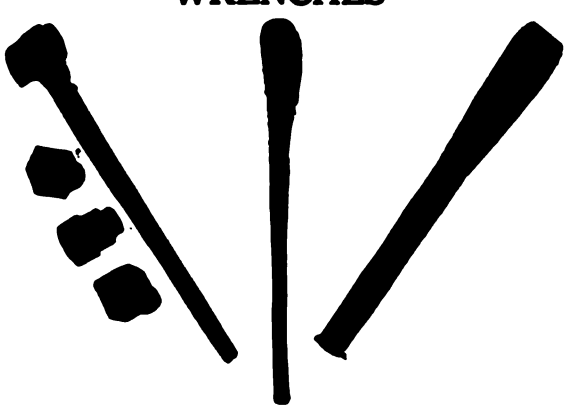
If you need a weight of any crushed, granular or powdered materials—if you have any problem of high speed sacking

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LOWELL WRENCH COMPANY
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Ask your hardware dealer for them



For Quick Hoisting Use the ROEPER Electric Hoists

Made in a variety of types to meet most every requirement.

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Traveling Cranes Electric Hoists Trolleys

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Choose Your Small Tools As You Would Your Heavier Equipment

Thousands of dollars are spent for the heavy equipment. It is chosen with a great deal of care. Every factor is considered.

But, the heavier equipment can only perform efficiently if the smaller tools like drills, taps, etc., are of the same high quality. So, why not choose your small tools just as you do your heavier machines?

MORSE Drills, Reamers, Cutters, Taps and Dies are the result of over half a century of experience and they show the results of this experience in their performance. They are real quality tools.

From shank to tip they give 100% service.



MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.

stitute for riveting on a structure designed for riveting. Such practice would result in a waste of material. Designs based on the use of welding are based on fundamental conceptions of putting the right amount of metal in the place where it will do the most good. An example of this may be found in the illustration of the bale stacker. The gusset members at the left side of the lifting platform is of welded steel construction. To duplicate the strength of this with riveted construction would involve more than twice the material and many times the labor.

How Far Can Formulas Reduce Industrial Accidents?

THE plant superintendent looked up as the door of his office opened after a knock and Jim Heath the shop safety man walked in.

"Good morning, Jim. How are you?"

"Fine, Mr. Wilson," and after a pause, "I came in to tell you I'm going to quit."

Superintendent Wilson laid down his pen in surprise.

"This is all new to me, Jim. What's the trouble? Want to go to somebody else?"

"Not exactly, sir. The fact is I don't seem to be getting along with the folks around here the way I ought to. There are a lot of things which ought to be done and then when I go after a foreman to get some of them done he doesn't seem to like it very well. I don't get into any regular squabble but just the same I think I have got too unpopular around here."

As Wilson described it afterward.

"We talked it over. I couldn't see it at first. It seemed to me that that was just what Heath was there for but after he had painted his side for me I concluded that maybe he was right after all and he quit."

"We still thought we needed a safety man," went on Wilson, "so we took one of our foremen and gave him the job. It wasn't very long until he was just about as unpopular as the fellow we had got from the outside and we let him quit too. We thought maybe we had selected the wrong man before so next time we picked out Lutz who is one of our most popular and best all round foremen. It wasn't long until he was in just as bad as the fellows ahead of him had been.

"We used to furnish him all the safety literature we could find," continued the superintendent, "and we sent him away to safety conferences once in a while. Every time Lutz read a piece of this literature or came back from one of these conferences he seemed to be all the worse.

"This went on till one day we called in the foremen and after we had them together we told them we were going to do away with the job of safety engineer in our plant and that we were going to put the whole job up to them. Do you know that since that time our accident experience has very materially improved and from what I can see everybody is backing accident prevention to the limit especially in his own department."

"Lutz?" finished Wilson. "Oh he went back to his old foreman's job and is just as popular as ever."

Make them wear their goggles.

Get a good safety engineer.

Put up a sign.

Have a safety rally.

Products not advertised in this issue write Industry Illustrated

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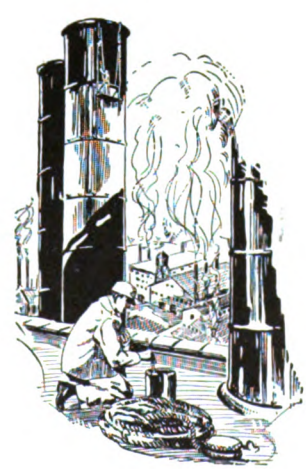
It's Yours for the Asking!

We want you to prove to yourself by actual test, that VALDURA ASPHALT PAINT is the ideal preservative for industrial requirements.

From our experience with your particular requirements we feel confident that once you have used VALDURA you will use it again. It is absolutely waterproof, weatherproof, and will also resist acid and alkali attacks. The base is 99.5% pure Gilsonite *Natural* asphalt.

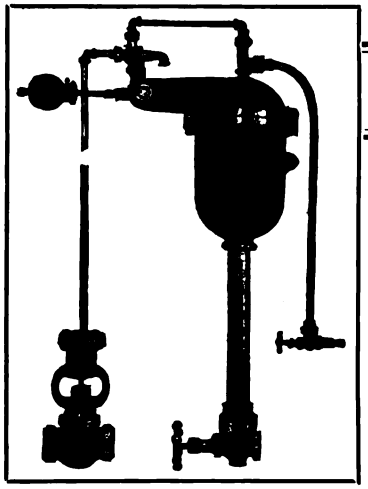
It costs just as much to put on poor paint as it does the best, at the outset—the labor involved is the same. BUT—poor paint soon gives out and frequent paintings are necessary! RESULT—labor costs rise, minimum protection.

Decide to protect your surfaces with VALDURA. You, too, will find it most satisfactory. Your request for a sample will be promptly complied with and will place you under no obligation whatever.



AMERICAN ASPHALT PAINT CO.
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Factories: Lincoln, N. J.
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Efficiency

Real boiler efficiency is never attained through hand feeding. A fluctuating water level is wasteful of fuel.

VIGILANT *Feed Water* REGULATORS

will put your boilers on an efficient basis. A constant water level means increased steam production, real fuel economy, less boiler strain, and safety.

Try a Vigilant or ask the opinion of those who use them. Catalogue on request.

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We Originate and Build. **Strand** Twenty-Two Years in This Industry

ESTABLISHED 1905

Flexible Shaft Equipments

Are known the world over for their Strength and Durability

Type M 7-1 H.P.



We Build Many Types and Sizes

Originators of the Three Speed Motor Counter Shaft

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It's easier to drive at these few details than really to get down to the heart of the accident prevention program. A few things such as these seem to be the stock in trade of many safety men and persistently worked at may badly damage the average safety man's usefulness before very long. They will prevent a good many accidents—for a while—but these phrases and the method which they actually accompany have brought the impression that there has grown up a sort of safety cult and that there is a group of men who believe that by following some fixed formula they can prevent accidents in industry.

It is doubtful whether many attempts to cut down accidents will succeed without doing those very things which have been listed. We know that there is a way absolutely to make eye injuries negligible in numbers and severity and that is to have goggles universally worn. Other parts of the safety formula are just as necessary.

However, it must be borne in mind that there are some concerns which yield readily to the first steps taken in accident prevention work. In these concerns the method must early be shifted from the old formulas. In other firms where a more difficult problem is presented perhaps these formulas should be dwelt on a little longer but extended repetition of these verbally or otherwise will not necessarily help—may indeed retard—the desired end and here too there is need for a change in attack.

Whether Superintendent Wilson recognized it or not Heath and Lutz made a very definite contribution toward cutting down accidents in this plant. They were the shock troops who broke the way for the advance. The management was not capable of discerning readily the change which took place, which Heath was largely responsible for and which made more than unnecessary the stressing of the old safety measures. Although he probably did not sense its full significance Heath did feel the effect of the change and resigned.

If he or Wilson had displayed a little more generalship the plant could have changed its method of attacking the problem of accident prevention and it would not have been necessary for it to go through the dropping of Heath and the near loss of Lutz and some of his associates. On the other hand more generalship than many concerns show was displayed when the whole problem was definitely and finally laid on the shoulders of the foremen.

We can not therefore ignore the fact that in some quarters the expressions of the safety movement not only fall on indifferent ears but they actually rouse a feeling of hostility. As a matter of fact safety is paying one of the penalties of its own effectiveness. While the cost of accidents has been one of the effective reasons for interest in the safety movement one of the most effective methods of its carrying out has been its human appeal—the human appeal which is one of the principal bases of advertising.

All these have been effective means of advertising but these particular phrases with the pictures are not so much in evidence as they once were. They have served their purpose and they have been withdrawn before they have been overdone and before the feeling of attraction which they have created for the product they have advertised has changed to a feeling of repulsion. The safety movement with its expression, its

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Across-the-Line Starters

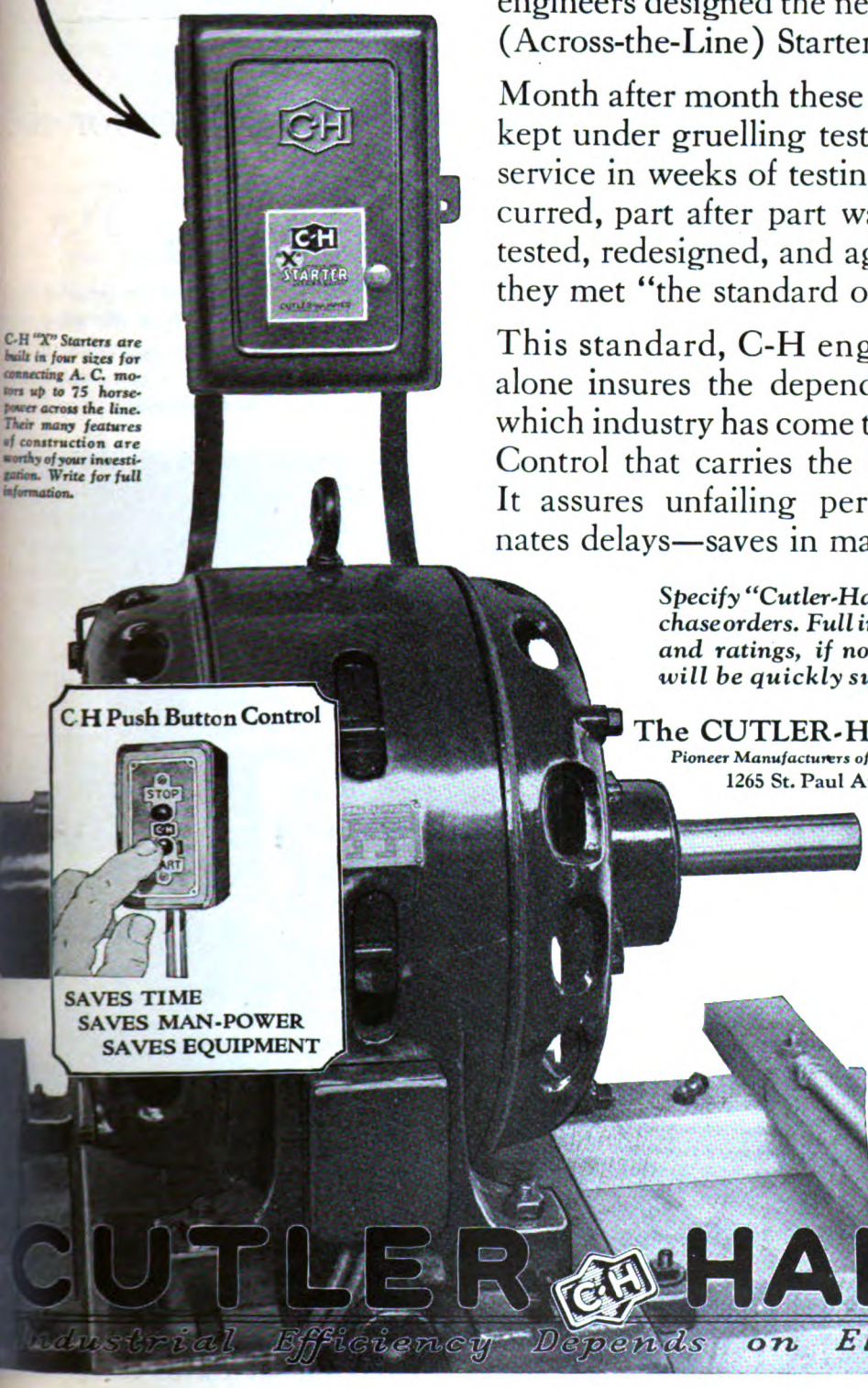
built to "the standard of millions"

NOT thousands, not hundreds of thousands—but *millions* of operations—this is the standard to which Cutler-Hammer engineers designed the new line of C-H "X" (Across-the-Line) Starters.

Month after month these new designs were kept under gruelling tests—given years of service in weeks of testing. As failures occurred, part after part was redesigned, retested, redesigned, and again retested until they met "the standard of millions."

This standard, C-H engineers maintain, alone insures the dependability in service which industry has come to expect of Motor Control that carries the C-H trade mark. It assures unfailing performance—eliminates delays—saves in maintenance.

C-H "X" Starters are built in four sizes for connecting A. C. motors up to 75 horsepower across the line. Their many features of construction are worthy of your investigation. Write for full information.



Specify "Cutler-Hammer" on your purchase orders. Full information as to sizes and ratings, if not now in your files, will be quickly supplied on request.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electric Control Apparatus
1265 St. Paul Ave., Milwaukee, Wisconsin

Thermal Overload Protection

Far superior to the magnetic type of overload, the Thermal Overload Relay on C-H "X" Starters cuts the motor from the line only at dangerous temperatures. By simply changing the heater coils, the same starter without compromise can be adapted to any size motor up to maximum capacity.

CUTLER C-H HAMMER

Industrial Efficiency Depends on Electrical Control

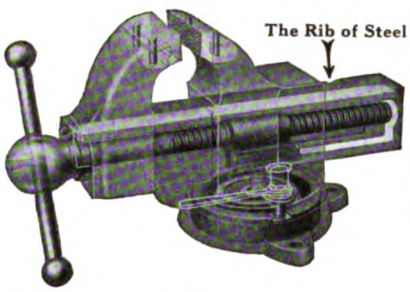
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The Strength of one Rib



This rib grew

to be a power in industry for it was cast into a strengthening bar of tough steel over the full length of a vise slide. Thus Parker made what was once the weakest part of a vise into the strongest.



PARKER VISES

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GRIP LIKE A GRIZZLY



SPOT CARS THIS WAY

One man can spot loaded or empty cars quickly and easily with a New Badger Car Mover. Your crew wastes no time in waiting for the switch engine to move cars to and from the docks. Work continues with hardly any delay. A New Badger will pay for itself in a short time through time thus saved. Order from your jobber.

THE ADVANCE CAR MOVER CO., Appleton, Wis.

New Badger

SLIP PROOF CAR MOVERS

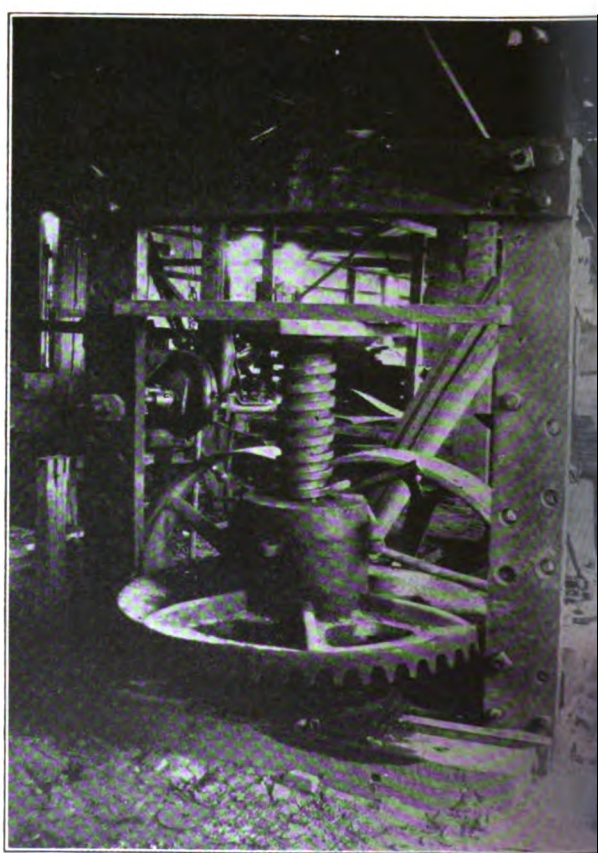
phrases and its methods is in the same position as a advertising campaign with fixed ads which have lon served an effective purpose. For the very reason of th long service some have come to believe these expressio and methods are themselves accident prevention and those who have come so to believe the name Safe Cult has in some cases been attached.

In quarters where these formulas are still usefu where perhaps the work is new they must still exist un they have filled their full place. In other quarte they must be changed without delay and in no circu stances must these formulas be considered as more than portion of the accident prevention program. In so quarters in fact they must very definitely be retired w into the background where no damage can be done accident prevention by their too prominent use.

High Power Press for th Shop

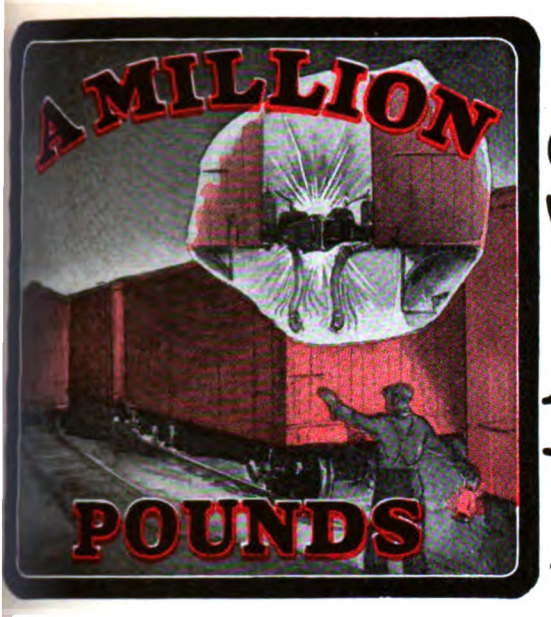
By L. M. Jordan

THE illustration shows how a vise or press of hi power was made from parts of an old screw t cotton baling press. This has been found useful many purposes in a machine shop where considera power is needed in clamping heavy metals.



A rectangular frame was made of pieces of old s iron by bolting them together at the corners, two p in a horizontal position at the top on either side of upright pieces and two others in a similar positio the base. The latter two are curved outward at

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Shock Absorbing Packages

A FREIGHT car moving at 3 miles an hour hits another car with a force of a million pounds. *What happens to your package?* And with the rocking, jolting and jerking and train vibrations hammering away en route—what happens *inside your package?*

No ordinary container can withstand gruelling abuse and protect its contents. Only packages that are expertly designed and staunchly built to *"stand the gaff"* will survive the punishment of modern shipping.

That's why experienced shippers specify H & D corrugated fibre shipping boxes. They are built by an organization that has spent 23 years on one problem—*packaging*. Every H & D box is scientifically designed to its individual requirements by expert Package Engineers and is carefully constructed of the finest materials by experienced workmen. Into every box is "engineered" safety for its contents.

The H & D Service Staff of 40 Expert Package Engineers is waiting to help you. A visit from one of them involves no obligation on your part. Write us about your requirements—or simply return the coupon to THE HINDE & DAUCH PAPER COMPANY, 299 Water Street: Sandusky, Ohio. The World's Largest Producers of Corrugated Fibre Shipping Boxes and Packaging Materials. Canadian Address: Toronto, King Street, Subway and Hanna Ave.



An H & D "P. E." Knows Packaging

Listen to what Mr. R. C. Close, Mgr. Lighting, of Central States General Electric Supply Co., Chicago, says about H & D Package Engineering:

"Our Attalite Commercial Luminaires have always been shipped in corrugated fibre boxes. Five years ago Hinde & Dauch Package Engineers designed a box which we used for some time. Later they designed an improved box on which we have standardized.

"Our present H & D box, though of superior design, costs 10% less than the competitive box formerly used. Being of simpler construction, it makes packing easier, and so saves 10% of what we pay the glass company for packing the globes. Being smaller in size, the box costs less and saves 14% in warehouse space. We can now store 8 packed fixtures or globes in the space formerly required for 7. The reduced weight of the H & D box also saves on all express and freight charges. Breakage is less than one-tenth of 1%."

H&D HINDE & DAUCH CORRUGATED FIBRE SHIPPING BOXES





THE HINDE & DAUCH PAPER CO.,
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Please have a Package Engineer call ☐

Send me copy of booklet, *"How to Use H & D Free Service."* ☐

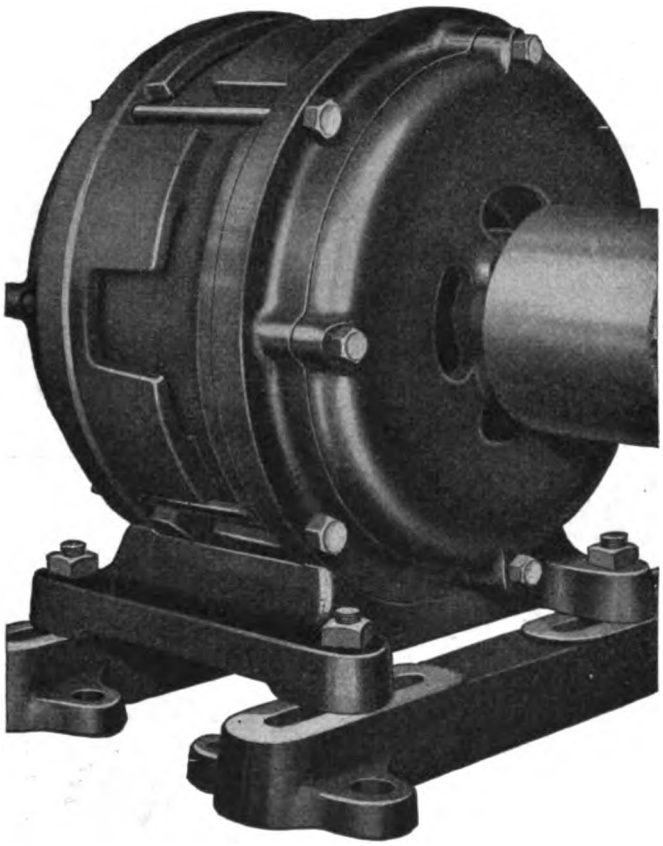
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BALL Bearings, used in the Valley Motor, distribute wear so evenly over the entire friction surface that the life of the entire motor is greatly prolonged.

Tests have shown that for every 100 watts necessary to overcome friction in a babbit bearing motor, only 25 watts are required by Valley Ball Bearing Motors.

That is one reason why we can say that Valley Motors cost less to operate—and do more.

Polyphase ¼ to 40 h. p., and Single Phase ¼ to 3 h. p. Write for descriptive bulletin.

VALLEY ELECTRIC CO., ST. LOUIS, MO.

District Offices: **Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco**

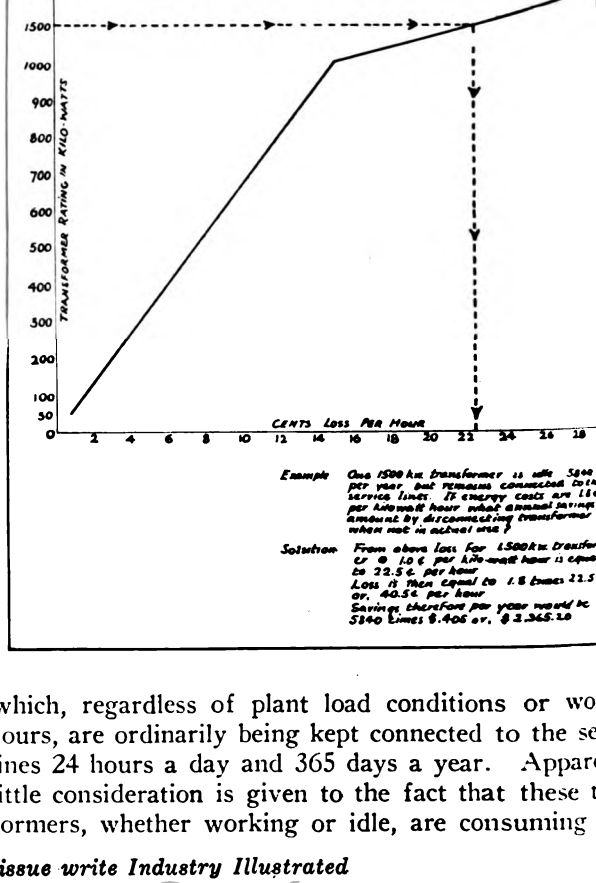
Valley

center to provide space for the press screw to pas vertically between them. The seat of the three-foo gear wheel that operates the screw rests on these tw base pieces. The pinion driving this large gear i mounted on the end of a short shaft and is supporte in a small frame beside the press. A friction drivin gear is also provided by which the screw is drive upward or downward by means of a short handle. Thi when pressed in one direction, runs the screw upwar and in the other runs it downward. The follow bloc was detached from the plate on the top end of the scre and a bar of iron was riveted across the top of the pla in its stead. This has slots in either end through whic the edges of the uprights of the frame slide to guic the screw. The bar also forms one jaw of the pre for clamping parts. On account of the low ratio the gears in the friction driving arrangement, conside able power may be developd.

A Simple Rule for Saving in Transformer Operatio

By Ottomar H. Henschel

MANY, particularly medium-sized, manufacturi plants employing purchased electric energy on so-called primary metering rate basis could, each ye save considerable money if more attention was paid the method of operating their sub-station equipme Some of these industrial plant sub-stations contain ba of transformers and others but a single unit, all



which, regardless of plant load conditions or wo hours, are ordinarily being kept connected to the se lines 24 hours a day and 365 days a year. Appare little consideration is given to the fact that these t formers, whether working or idle, are consuming

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At Madison Square Garden

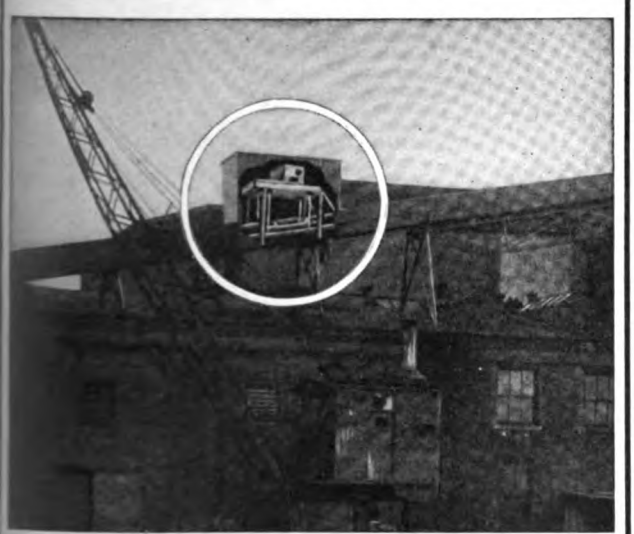
TWO speedy Baker elevating trucks help Tex Rickard transform 24,350 sq. ft. of surface from a hockey field to a prize fight arena or a circus lot over night.

These "Handy Andies" do in two hours the job that formerly required thirty men ten hours by hand. Versatile Baker tractors, trucks and cranes save time and money in a wide range of industries. Write today for a fully illustrated catalog.

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2179 West 25th Street Cleveland, Ohio

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S.PAT.OFF.

Baker



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Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.
180 Autumn St. Passaic, N. J.

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TRADE MARK



AUTOMATIC ADJUSTABLE
Steel Stools for Office, Shop and General Factory Work
Patented March 16, 1926

STEEL CONSTRUCTED

Adjustable to any desired height in a moment's time without any tools. Beautiful hardwood seats.

The patented automatic adjustment is a radical departure from the old fashioned screw type or angle iron stool. It is instantaneous.



A complete line of Stools and Chairs to suit any requirement. Built for

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END-WOOD WHEELS

—decrease overhead

—increase production

50%

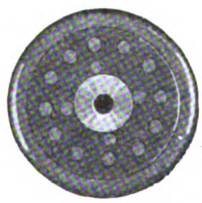


Regular Duty Type Oilless End-Wood Bearing



Silent—
Easy-Rolling
Wear like a
Butcher's Block

Heavy Duty Type Hyatt Roller Bearing



Made to fit any type of TRUCK or TRAILER

Type of Wheel Supplied for Casters

Send for booklet, prices, new discounts!

METZGAR CO., Inc.

459-503 Grandville Ave.

Grand Rapids, Michigan, U. S. A.

or less energy to supply core losses and some copper losses with the consequence that no few hundreds of dollars are being practically thrown away each year.

In one comparatively small metal-working plant there are installed two 150 kv. a. transformers which, although the demand for energy seldom is in excess of the rated capacity of one unit had it been kept in service continuously. Investigation proved that the demand for both units existed about but no more than 25 per cent of the time so that one transformer had been needlessly operating for approximately 8,010 hours.

Assuming core, and some copper losses equal to about 1.5 per cent. of the transformer rating of 150 kv. a., the loss per hour was equal to 2.25 kv. a. or 18,022.5 kw. hr each year. The average energy rate is $0.016 per kilowatt hour so that, as a consequence, the annual loss in energy cost was equal to 18,022.5 × $0.016, or $288.3 a year.

It is thus evident that a little watchfulness on the part of the plant electrician to cut out of service one 150 kv. a. unit whenever it is not actually required, has proven well worth the effort and time.

Another plant sub-station contained a single 400 kv. a. transformer also in operation 24 hours a day, this, however, for the reason that although the ordinary working day was but 9 hours, some service had to be available for lighting and so forth during the remaining hours of the year. In this instance, however, there was no unit to cut out of service and accordingly it was decided to purchase and install three single phase used transformers (to provide the necessary three-phase service) which cost the company $380.00 installed.

With this bank of transformers in use, therefore, there all but the actual plant operating hours losses of approximately 6,560 × 0.015 of 400 or, 39,360 kw. hr. were eliminated. Average energy cost at this plant $0.0 per kilowatt hours so that the yearly savings were equal to $511.68.

Fixed and operating charges on the bank of small units, which naturally had to be balanced against the gross savings, may be enumerated as follows:

Fixed Charges.	
Interest @ 5%	$ 19.0
Insurance @ 1%	3.8
Taxes @ 2%	7.6
Depreciation @ 10%	38.0
Total	$ 68.4

The smaller units are cut out of service during p working hours so that accordingly the losses of t transformers had to be borne for 6,560 hours amounted to approximately 0.015 of 45 kw. or, 0.675 or, for the year, 4,428 kw. hr. which, at $0.013 per watt hour is equivalent to $57.56.

The total annual charges are then, $125.96, the am actually required to bring about savings of $511.68. other words, the net savings are equal to $385.72.

As an additional example let us cite the case of an plant, a steel foundry, in which there is installed a kv. a. transformer employed exclusively for power which had been kept on the power company's lines gardless of plant operating hours. Lighting is sup by a separate smaller unit.

This plant is, as a rule, operated 12 hours each w ing day and that for 300 days each year. As a c

not advertised in this issue write Industry Illustrated

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"Red Shield" High Speed Drills

With 46 years' experience

we pronounce the "Red Shield" the best Drill yet produced

Should be used in every progressive shop where "cost reduction" is the slogan.

The "Red Shield" is imprinted on each Drill.

THE STANDARD TOOL CO.

CLEVELAND

New York: 94 Reade St. Chicago: 552 W. Washington Blvd.

Fredk. Pollard & Co., Ltd., London and Leicester, England Paris, France—Burton Fils Copenhagen, Denmark—Nienstaed & Co.

Real TRIBUTES

An ever-increasing number of responsible manufacturers who have used MASTER GUARANTEED MOTORS for years *continue* to buy them in constantly greater quantities. What higher tribute can be paid these motors?

THE MASTER ELECTRIC CO.
Linden & Master Aves., Dayton, O.



STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio Less than 40°

POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT

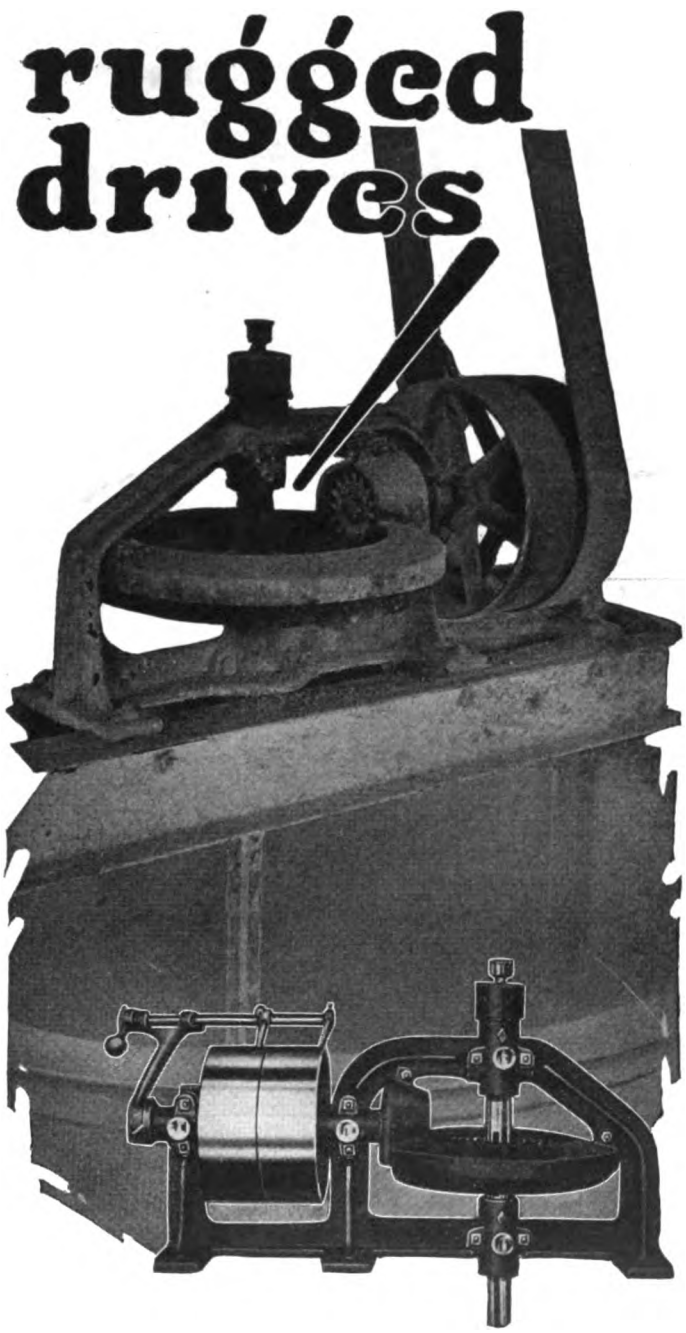


A Dozen Ways to Save

THE POWELL literature illustrates and describes this complete line of modern Pressed Steel Material Handling Equipment. It points out a dozen ways to save money and improve handling and storing methods in both large and small plants. Ask us for details and prices—both gladly sent.

The POWELL PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

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Standard units for every purpose — simple — inexpensive — send for complete specifications

NEW ENGLAND TANK & TOWER CO.
EVERETT, MASS.
NEW ENGLAND (enclosed) & NETT-CO. (open)
Agitator Drives
30 Church St., New York

quence, the foundry company suffered a loss of (0.01 × 1,000 × 5,160 × 0.011) = $851.40.

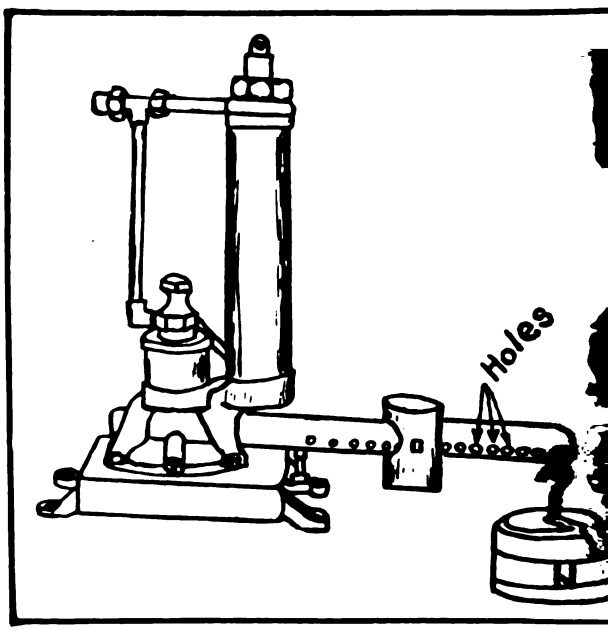
As soon as the attention of the management had bee called to the state of affairs the power transformer wa kept off the service lines at all times except when energ was actually required.

Consideration has been given only transformers of such capacity as ordinarily met with in industrial pla service and with energy at a unit cost of one cen Assuming, as illustrated, that it is desired to determi the savings which may be realized by disconnecting 1,500 kw. transformer whenever not in actual use (this case 5,840 hours per year) and that energy is bei paid for at a rate of 1.8 cents per kilowatt hour.

Starting at 1,500, the rating of the particular tran former under consideration, and following to the rig until the full line curve is intersected and then continui along the vertical we find 22.5 cents. This represen the cost of maintaining the idle transformer on the serv lines each hour but that at an energy cost of one cent p kilowatt hour. In order, therefore, to secure the loss a rate of 1.8 cents per kilowatt hour, 22.5 is multiplied 1.8 with the result equal to 40.5 cents per hour. Ob ously then, the possible savings per year will be equal 5,840 × $.405 or, $2,365.20.

Making a Damper Regulator More Delicate

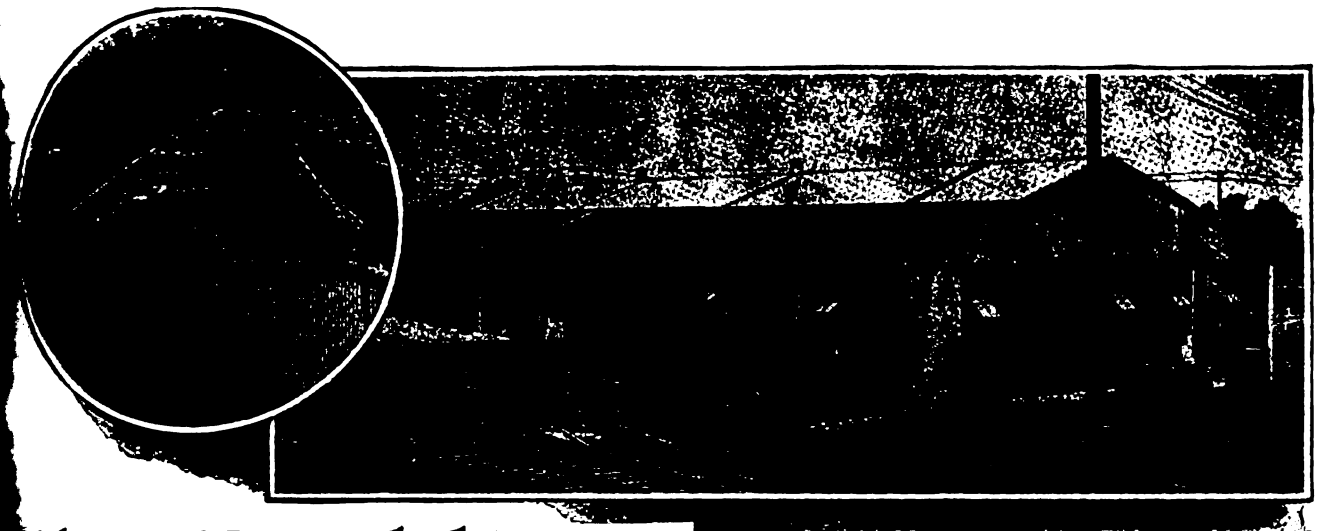
A USER of a damper regulator made along the li of the sketch shown recently discovered that could make the device delicate enough for use on va heating systems, although it was not originally inten for such systems. By drilling holes along the lever as indicated the weight at the extreme right was mo



inward, thus really making the lever arm shorter. found after making this very simple change in design the regulator now operates very satisfactorily on ceedingly low pressures.

F dvertised in this issue write Industry Illustrated

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The Building that changed its job . . . . .



IN the circle above is a Maryland Metal Building as first erected for the Gulf Refining Company—a 50′ x 180′ x 12′ barrel storage structure with a 0′ x 50′ x 12′ cooperage plant attached.

When the need for this building ceased, the entire structure was dismantled, moved to a new location, and a large store house and machine shop were reerected. The lower circle shows the interior of the new structure.

There was no loss. A Maryland Metal Building is always an asset. It can be altered, enlarged or dismantled and moved with a salvage value of 90%. Quickly and easily erected, it provides industrial users with the most economical floor space that can be obtained in any form of permanent construction.

The special material of which it is made—

Lyonore Metal an alloy

The Corrosion-Resisting Alloy

assures lifetime service and puts a Maryland Metal Building in the same class with a structure of brick or concrete.

The Maryland Metal Building supplies the answer to your questions regarding more working or storage space.



Write us regarding your requirements, and without obligation or expense to you our Engineering Department will prepare specific recommendations that will be of valuable assistance to you.

MARYLAND METAL BUILDING COMPANY

Main Office and Factory, Baltimore, Md.

30 Church St., New York City — 716 Pennsylvania Bldg.; Philadelphia

419 Rhodes Bldg., Atlanta, Ga.

MARYLAND METAL BUILDINGS

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OUT in the far west an appliance manufacturer was having motor trouble. A roving "high-pressure" salesman had sold him something his factory couldn't (or wouldn't) build. The stock motors he delivered didn't "stand the gaff" under unusually heavy service conditions.

Literally "up against it", the customer took the Domestic motor from a famous make of factory tool—and tried it out on his product. It did the work, and begged for harder going.

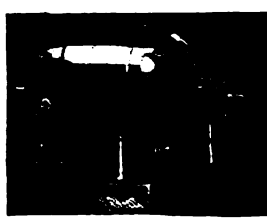
As a result of correspondence, Domestic is today supplying this customer with a motor of the same type and design, but slightly modified—and we're proud of him as a reference. Thus, 2000 miles from our factory, a Domestic sample sold itself.

The Sample *that sold itself* ---2000 miles away!

All that the Domestic Electric Company asks of any prospective customer is an opportunity to turn over to its laboratory an appliance requiring a fractional horsepower motor—then let the motor our engineers develop speak for itself. Somewhere in our long experience as builders of special motors we have met and solved most of the mechanical and electrical problems of appliance manufacturers who have motor problems to solve—and ironing out the little "kinks" that intrude on any motor application is routine business with Domestic Electric. There is permanence as well as satisfaction, in a connection with the Domestic Electric Company—the motor builder whose factory functions as a department of your business. A line of inquiry will bring information on any problem involving the manufacture or sale of appliances driven by fractional horsepower motors.

THE DOMESTIC ELECTRIC COMPANY
7209 St. Clair Avenue CLEVELAND, OHIO

Manufacturers of fractional horsepower motors exclusively (90)



Domestic Universal Motor
Speeds—
No Load - 7500 r.p.m
¼ Hp., - 5500 r.p.m
½ Hp., - 4750 r.p.m
¾ Hp., - 4000 r.p.m
Weight 38 pounds

Domestic Electric Motors

"Industry's Biggest Little Thing"

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A Horton Tank doubles the effectiveness of a sprinkler system



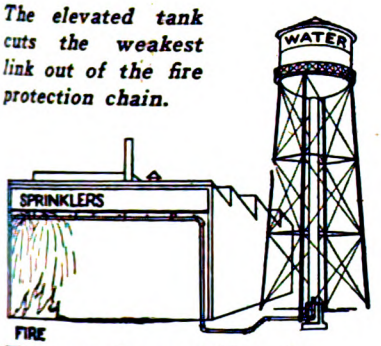
THE water stored in an elevated tank has already been elevated above any point in the plant where fire might start. Gravity is the only force needed to carry the water to the fire. You take no chances when you rely on the pull of the earth.

And when that elevated storage is provided in a Horton Tank you still further increase the effectiveness of your sprinkler system for Horton Tanks are built of steel. They will not rot nor burn. They give long life at minimum annual cost.

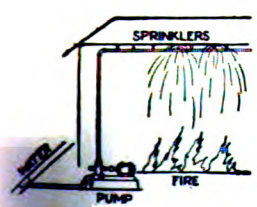
Fire protection is vital in any plant. It is true economy to insist on the most effective protection possible.

Our book "Horton Tanks for fire protection" contains interesting information for any industrial executive. May we send you a copy and quote you on a tank for your requirements?

The elevated tank cuts the weakest link out of the fire protection chain.



Water supply—sprinkler—fire.



Water supply—pump—sprinkler—fire.

CHICAGO BRIDGE & IRON WORKS

Chicago.....2465 Old Colony Bldg.
New York.....3169 Hudson Terminal Bldg.
Cleveland..... 2238 Union Trust Bldg.
Dallas.....1658 National Bank Bldg.
Atlanta.....1023 Healey Bldg.
San Francisco.....1043 Rialto Bldg.
Havana, Cuba.....Apartado 2507

HORTON TANKS

I. I. 4-Gray

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222 Operators Work Better Under Improved Lighting

FIVE times as much light is now available to the 222 operators of the Darlington Textile Company of Pawtucket, Rhode Island. From irregular spotty lighting that slowed down production, the Jacquard looms now have uniform and adequate illumination throughout the working area. The company is highly enthusiastic as to the benefits derived from the new lighting which cost less than 1 per cent of the payroll of operators affected to install and operate.

This same satisfaction was experienced by over 15,000 factories which brought their lighting up to standard last year.



BEFORE—Spotty, uneven illumination interfered with production

AFTER—Uniform illumination decreases opportunity for spoilage

The Blackstone Valley Gas & Electric Company of Pawtucket R. I., gave expert engineering service on lighting to many factories in its area last year and has specialists available to assist customers in obtaining the many benefits of proper lighting.

Industrial Lighting Fact No. 6

You, too, can increase your production by bringing your lighting up to the proper standard. Without cost your local electric light company will show you how.

Industrial Lighting Committee, National Electric Light Associat
29 West 39th St., New York

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"Big Mike"

The Only Tri-Wheel Truck

It carries the whole load

"Big Mike" will stand more abuse and punishment than any other husky in your plant. He is a brute for strength and carries all the load. That's what the third wheel is for.

With the Tri-Wheel truck, heavy loads can be handled with minimum effort,—in fact, any man can push a 1500-pound load as easily as he would a 200-pound load on an ordinary truck.

"Big Mike" is one of the SERVICE handling units that are helping plant managers in every industry reduce their materials handling costs. SERVICE Hand Trailers and Tilt Trucks are equipped with the SERVICE Caster, Master-made with frictionless, floating pivot; Timken, Hyatt and Hard Steel Ball Bearings.

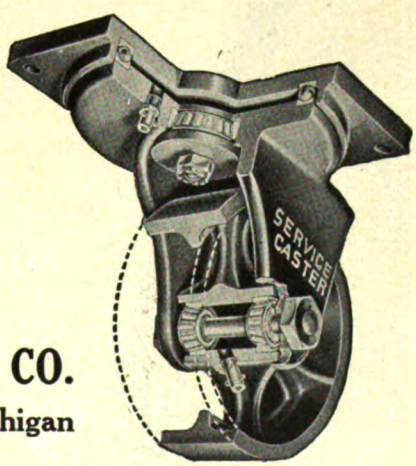


Have you sent for our plan which shows a three-to-one investment in SERVICE Casters and Trucks? Write for it.



Easy to handle
Saves time and labor

The SERVICE CASTER resists shock, strain, thrust and wear.

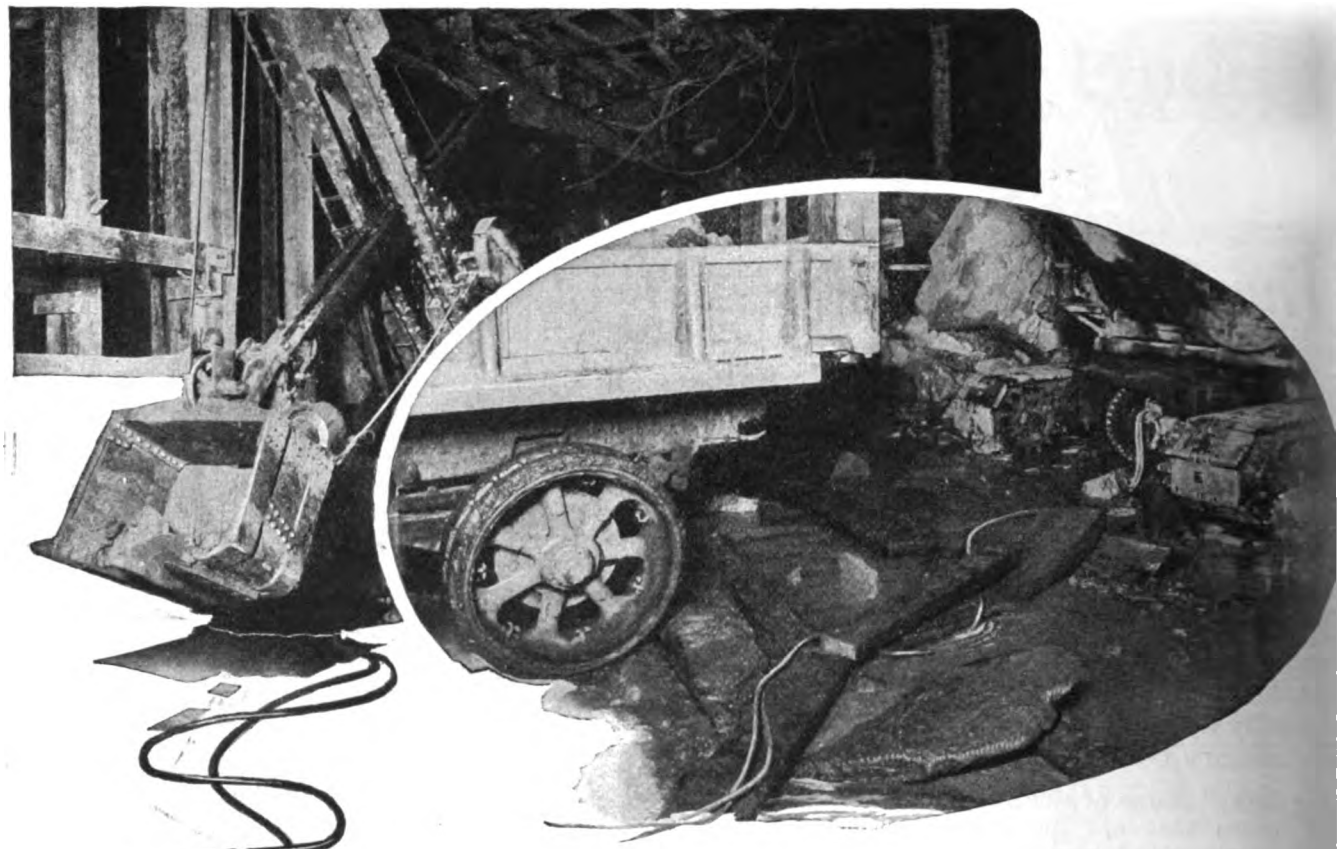


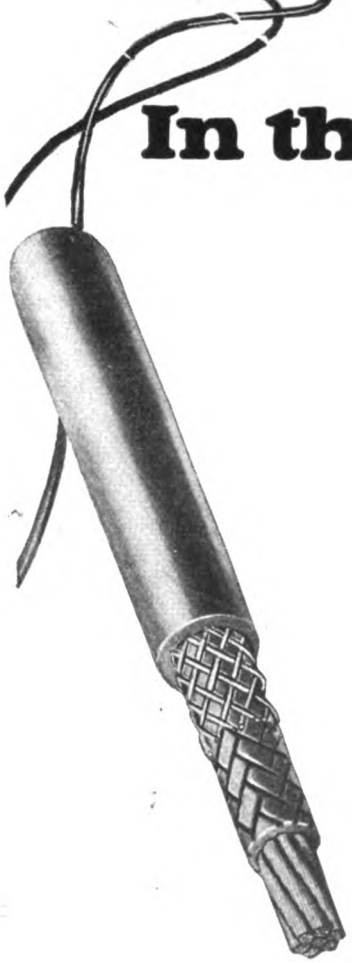
SERVICE CASTER & TRUCK CO.
519 No. Albion Street Albion, Michigan



SERVICE CASTERS TRUCKS

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In the Subways of New York

Far below the sidewalks of New York—deep down in the vitals of Manhattan's rocky strata—"U.S." Royal Portable Cord is helping the new 8th Avenue Subway burrow its way to completion.

Here "U.S." Royal Portable Cord is strung along sides of mammoth excavations, midst hammering of stone drills, booming of dynamite blasts and the belching forth of avalanches of broken jagged rocks; jerked through pools of oily, muddy water, across the sharp-edged segments of blasted rocks—and yet "U.S." Royal Portable Cord delivers its electric current unfailingly.

What conditions could be more severe!

Let us send you a sample of this tough, sturdy cord.

United States Rubber Company

1790 Broadway Trade US Mark New York City

Branches in All Industrial Centers

AND—
When you need a good quality friction tape or splicing compound—Specify "U.S." Holdtite Friction Tape and USCO Splicing Compound.

"U.S." Royal Portable Cord

REG. U. S. PAT. OFF.

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BRINGING THE TEMPERATURE TO YOU

Straight From the Bubble Towers

Or straight from any other point that is equally inaccessible the Motoco Industrial Thermometer brings the temperature to you, where a reading may be made with ease, accurately.

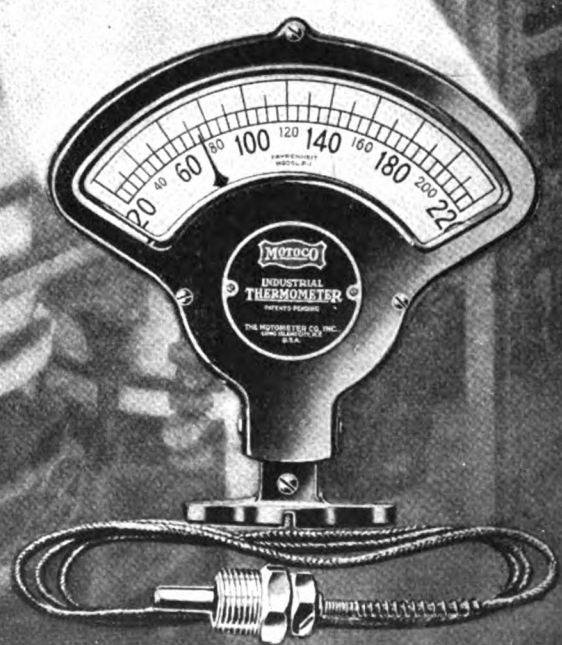
Thus one instrument fulfills the two most important requirements of temperature checking equipment—convenience and reliability. These thermometers are described clearly and simply in Catalog No. 9. Send for your copy today.

The Moto Meter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.
Chicago Office, 820 Tower Court
The Moto Meter Co. of Canada, Ltd., Hamilton, Ont.
National Gauge & Equipment Division, La Crosse, Wisc.

The Industrial Division offers the services of its engineering staff to manufacturers requiring thermometer equipment.

The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

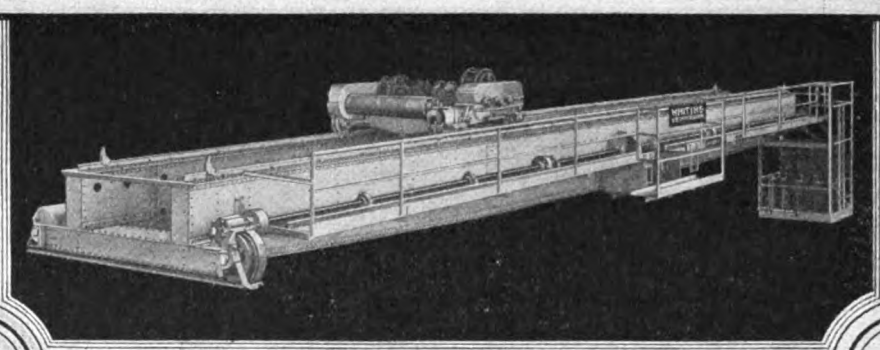
MOTOCO
INDUSTRIAL THERMOMETER



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CONTINUING SUCCESS CAN ONLY BE BUILT ON QUALITY

WHITING



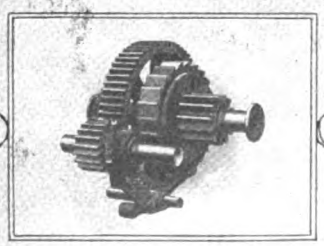
WHITING CRANES HAVE BEEN AN OUTSTANDING SUCCESS FOR 35 YEARS

In spite of keen competition for small crane business, Whiting has consistently refused to lower the quality of its crane construction. Bearings, gears, pinions, axles, wiring, brakes, and other details of a crane trolley cannot be cheapened below a certain standard without cutting the life and reliability of operation and increasing the maintenance cost in much greater proportion. Whiting designers have economized on all these features as far as good engineering practice permits. Whiting customers do not want cheaper construction because they know that in the last analysis it is not cheaper—but much more expensive.

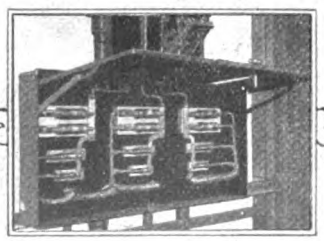
The Whiting record during the past 35 years is ample proof that Whiting Cranes have uniformly high quality and that industrial executives appreciate this one quality policy.

CRANE CATALOGUE NUMBER 200 ON REQUEST

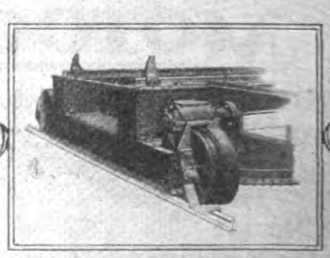
WHITING CORPORATION
15637 Lathrop Avenue
HARVEY, ILL. (*Chicago Suburb*)



Automatic Mechanical Brake—operates in oil bath.



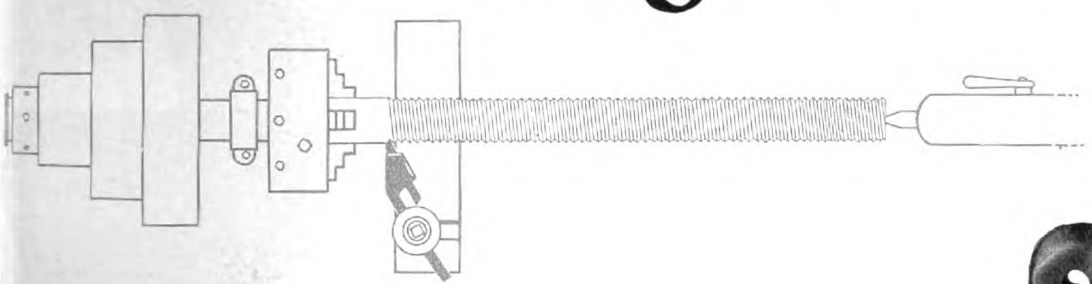
All enclosed "safety first" Switchboard.

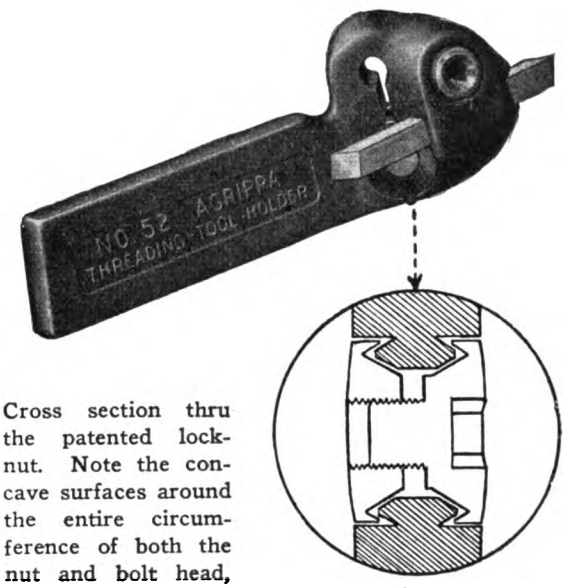


M. C. B. type End Truck.

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"Use that AGRIPPA threading-tool"





Cross section thru the patented lock-nut. Note the concave surfaces around the entire circumference of both the nut and bolt head, **which clamp tightly over corresponding convex surfaces on the holder. Not merely a wedge, but a chatter-proof lock, making movement of the spring head impossible when tightened.**

"USE that 'Agrippa' threading-tool—the offset shank will let you work close to your chuck or face plate."

That has been truly said of Williams' "Agrippa" Threading-Tool Holders. As the drawing above clearly shows, the cutter point is ahead of the carriage, yet the tool is in proper line to spring away from your work. **A distinct advantage over the straight shank tool holder.**

The Lockable-Spring Head provides a spring tool for fine work or, by a simple turn of the Lock Nut, with a rigid tool for coarse threading and heavy cuts. Let us send you some valuable Tool Holder literature. Write today.

J. H. WILLIAMS & CO.

"The Drop-Forging People"

New York BUFFALO Chicago



The "Agrippa" line is complete. In the Turning-Tools you will find that inherent Williams' **quality which cuts costs and speeds production.**

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"AGRIPPA"
TOOL HOLDERS
"THE HOLDERS THAT HOLD"

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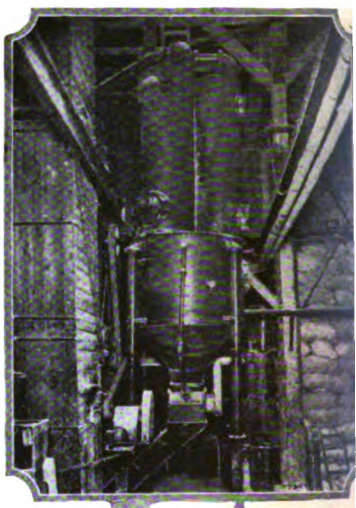
One Man Handles Soda Ash Over a Distance of 125 Feet

A manufacturer of soap and toilet preparations, in fact, one of the largest and best known in the field, now handles soda ash pneumatically, the DRACCO way.

Formerly, a big gang was required and the conditions proved injurious to the health of the workers.

The DRACCO System installed here requires but one man to do the entire handling from cars to bins and the soda ash is conveyed at the rate of 10 tons per hour without a particle being wasted.

DRACCO Systems handle all kinds of bulk, granular and dusty materials. We have a number of bulletins describing various DRACCO installations, which will gladly be sent on request. No obligation.



Dust Recovering & Conveying Co.
Harvard Avenue and East 116th Street
Cleveland, Ohio



DRACCO DOES IT

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The Handbook of the U-Re-Lite contains 96 pages of beautifully illustrated text on "Fool-proof" electrical protection and how it can save time, wasted steps and many dollars in your plant.

The Handbook of the I-T-E Circuit Breaker is a 263-page volume of data, illustrations, charts, designs, installations and other interesting material on circuit breakers of every rating and for every purpose.

FREE! These Two Valuable Handbooks

HERE ARE TWO of the most complete and interesting Handbooks ever printed on the subject of electrical protection. No technical library is complete without them—and your copies are mailed absolutely free!

If you operate motors or electrical machinery—if you buy your power or develop it—if you want lower production costs and less "time-out" for repairs—if you want absolute safety for your plant, your equipment and your workers—then you will surely want to read the important facts contained in these books.

The Handbook of the U-Re-Lite fully explains the protection afforded by the "OVERLOAD," "NO VOLTAGE," "SHUNT TRIP," "BELL RINGING," and "DIRECT ACTING TIME LIMIT" features of U-Re-Lite—the I-T-E Circuit Breaker in the Steel Box. Interesting installation photographs are shown, together with valuable data and diagrams.

The I-T-E Handbook is a storehouse of information on all types and sizes of dependable circuit breakers, with tabulations, drawings and figures on numerous kinds of installations.

As a manufacturing executive, engineer or purchasing agent, you will want one or both of these books. Check the coupon below, and we'll see that your copies will be forwarded at once. No obligations, of course.

THE CUTTER COMPANY—*Established in 1888*—500 N. 19th St., PHILADELPHIA

CUTTER

U-RE-LITE I-T-E CIRCUIT BREAKERS

FILL OUT COUPON TEAR ALONG THIS LINE MAIL TODAY

THE CUTTER COMPANY, PHILADELPHIA. 5

Without obligating me in any way, please send a copy of:

☐ Handbook of the U-Re-Lite

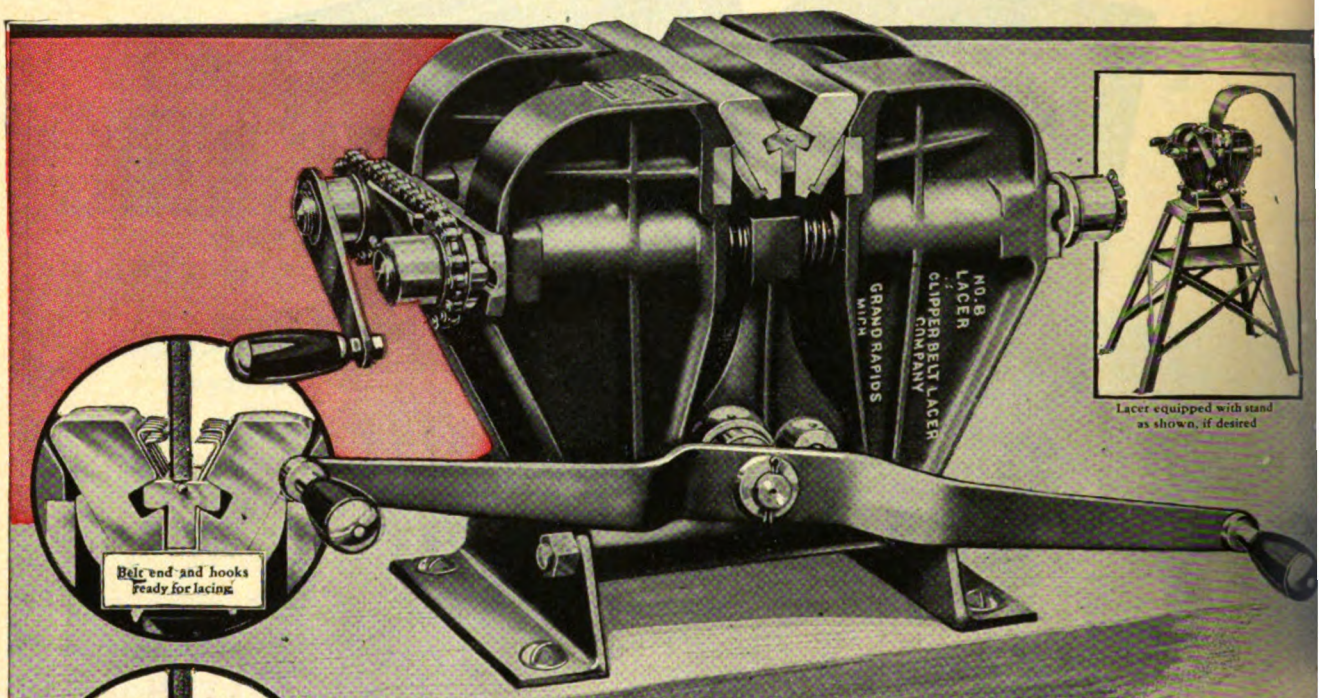
☐ Handbook of the I-T-E Circuit Breaker

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Address.....

City.....State.....

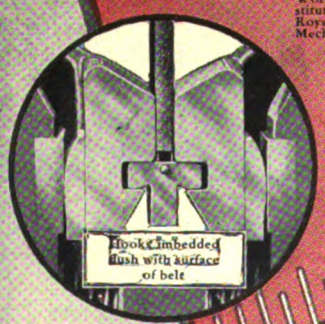
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Lacer equipped with stand as shown, if desired







A New Clipper Lacer!

Laces Both Ends of an Eight-Inch Belt in 1½ Minutes

A THREE-QUARTER turn of the crank—and the powerful jaws of this new lacer force a row of Clipper Hooks cleanly and uniformly into an eight-inch belt. Less than 1½ minutes is required to lace both ends of a belt.

A pressure of 45,900* pounds on the belt is developed by an entirely new principle, imbedding the hooks in perfect alignment absolutely flush with the surface, thus prolonging the life of the lacing and reducing the wear on the hooks and pulleys to a minimum. And it will lace even the smallest belt with increased efficiency and economy.

Industrial plant superintendents will immediately appreciate the value of the new Clipper Trojan No. 8 Lacer to their plant operation.

The Clipper Trojan No. 8 Lacer is furnished with or without stand. Weight 100 pounds. For complete demonstration and prices communicate with your nearest Clipper dealer, or with the

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN

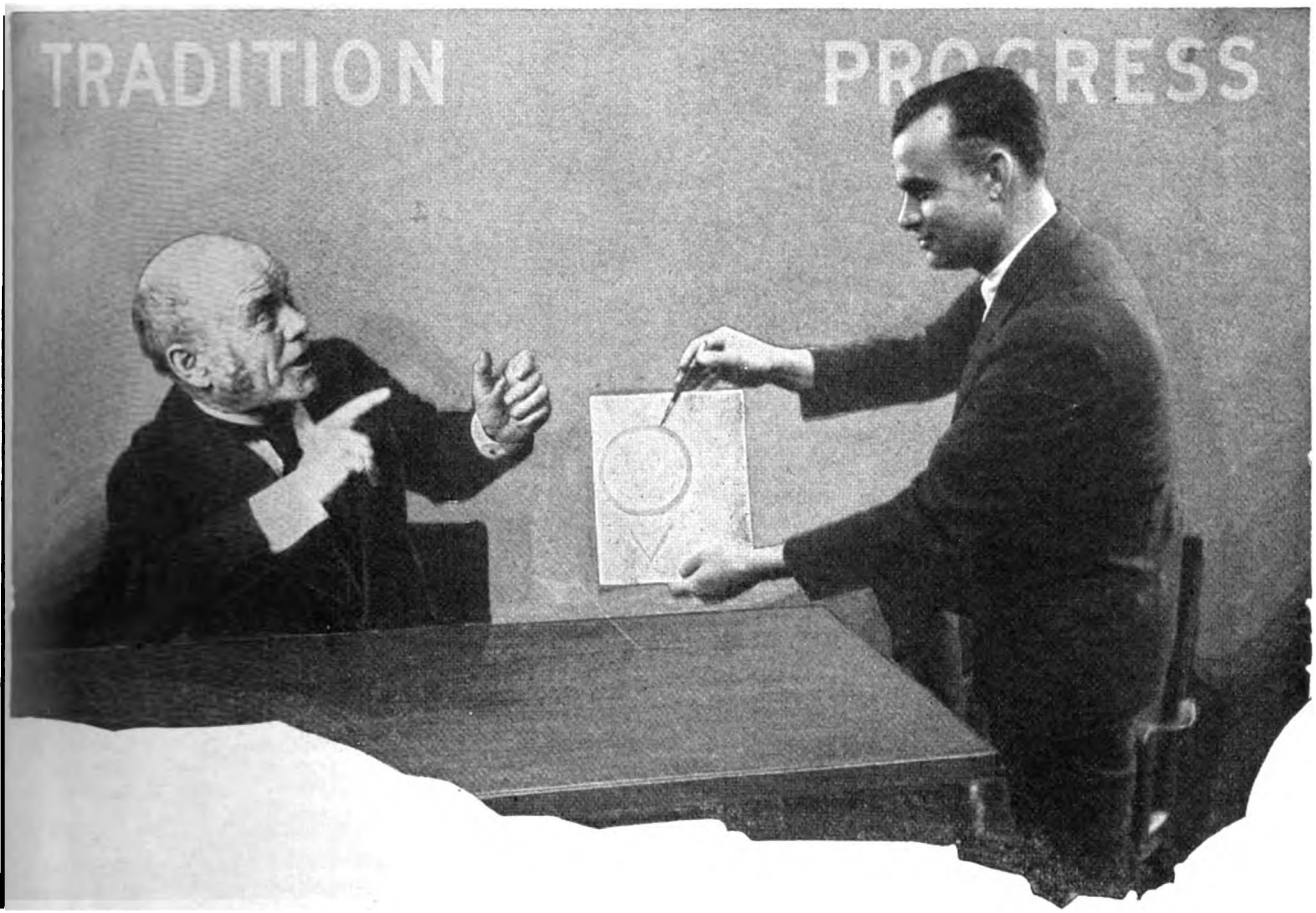
QUALITY BELT LACING

* These figures were determined by actual tests made in the laboratories of the Worcester Polytechnic Institute by Prof. Francis W. Roys, Head of the Dept. of Mechanical Engineering.

Clipper
Trojan Belt Lacer

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Pop Gets a New Slant on Motor Oiling



"Lad—

I find that the shutdown yesterday was due to motor trouble. The foreman tells me that this new motor burned out a bearing and it wasn't overloaded—it didn't get enough oil. What are you trying to do —spare the oil and spoil the motor?"

"No, Pop—

it's your friend the motor maker who is doing it. That trouble is due to that Scotch oil ring that your old crony puts in his motor—a piece of solid brass—just as they did in granny's day. I asked you to buy a Linc-Weld motor because one of twenty-one tradition shooters in that motor is this TROUGH RING. It carries ten times as much oil to the top of the shaft. It can NEVER skimp on oil."

Read page 10 of the Motor book published by:

The Lincoln Electric Co., Dept. No. 18-4, Cleveland, Ohio

MA-3

"Linc-Weld"

LINCOLN MOTOR

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Digitized by Google

A Better Wearing Brush for Every Use

End of service cost counts on small items as well as large. Save on brushing and sweeping costs by specifying Osborn Brushes.

Their higher first cost is more than justified because they do perform better and wear longer—they really cost less in the end.

Osborn's recommendations for using special brushes have invariably resulted in lower production costs.

The Osborn man will gladly analyze your problem and report on possible savings.



THE OSBORN MANUFACTURING COMPANY
INCORPORATED

5401 Hamilton Avenue Cleveland, Ohio

Branch Offices:

New York, Detroit, Chicago, San Francisco, Los Angeles

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Insist on



VENTURAFIN

Trade Mark

METHOD OF UNIT HEATING

THE revolutionary method of proved dependability that **forces** heat—as much as you want—where you want it—cheaper to buy—cheaper to install—cheaper to maintain—with five times the efficiency of ordinary heating methods.

AMERICAN BLOWER COMPANY, DETROIT, MICH.
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.

(575)

American Blower

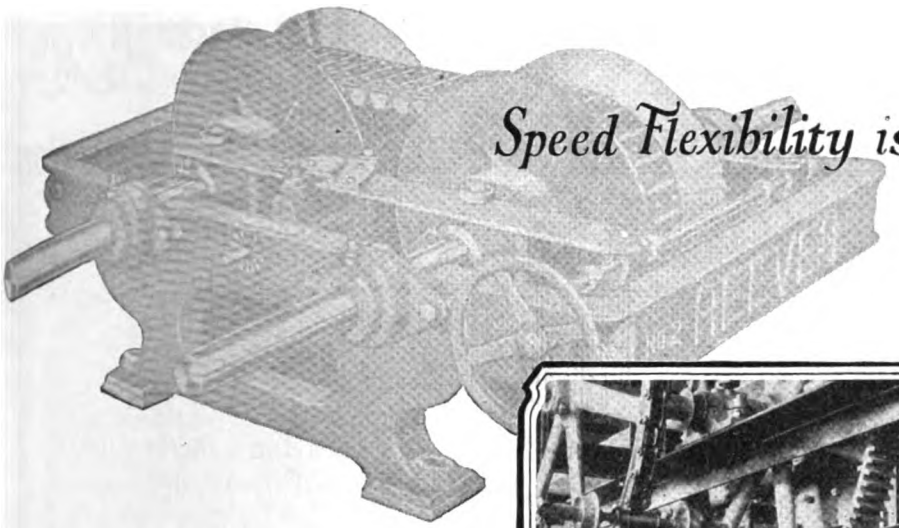
"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRA

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE

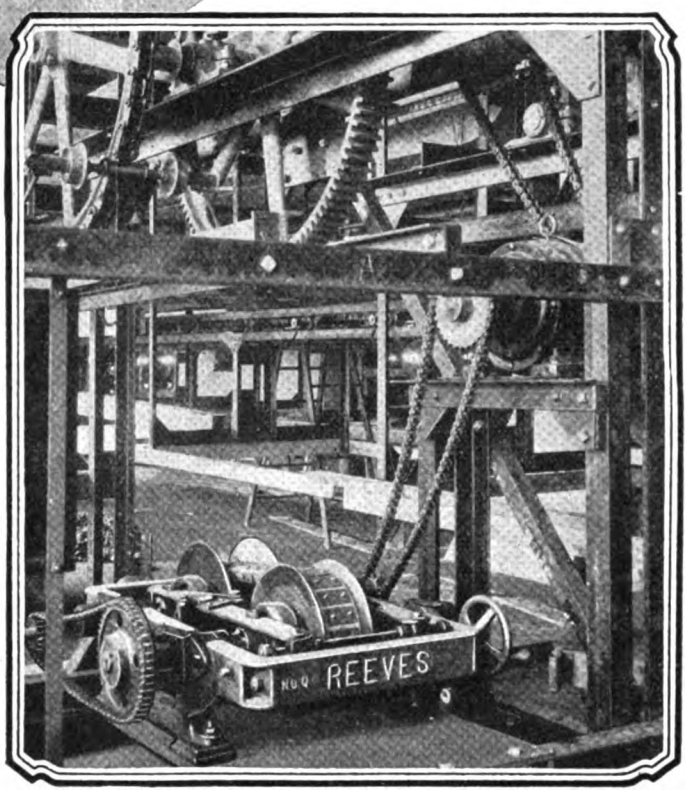
✓ HEAT WITH UNIT HEATERS

Ask your heating contractor for prices—if he does not handle the Venturafin Method of Heating, write us for one who does.

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Speed Flexibility is VITAL!



A REEVES-regulated oven conveyor for wheels at the Packard Motor Car Company, Detroit

THE REEVES Transmission is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. It does not give just *steps* in speed—but *any* speed between fastest and slowest, even to the smallest fraction of a revolution.

The REEVES may be mounted in any convenient position—on the floor, wall or ceiling—or it may be incorporated right into the machine it is to regulate. **It is easy to install and simple to operate. Pays for itself in a short time. Lasts for years. Accurate and dependable, always.**

In addition to the standard hand wheel control, REEVES Transmissions may be equipped with electrical remote and mechanical remote controls, so that merely by pushing a button or pulling a cable, you can regulate instantly the speed of any machine. Also, for special installations, several different types of automatic controls have been designed, eliminating the need for an operator.

Any Speed You Need!

THE REEVES Transmission represents the only method by which you can get *any* speed on *any* machine at *any* time. It makes your production machines and conveyors absolutely *flexible*—enables you to run them at *any* speed you desire. The advantages and economies of the REEVES in *your own industry* are described fully in our new catalog G-66. Send for it today.

REEVES PULLEY COMPANY
Established 1887
COLUMBUS, INDIANA

REEVES
Variable Speed Transmission

INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

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The Keystone Driller Co.

Uses WILLIAMSPORT WIRE ROPE for your protection

not alone because of its uniform superiority but because Keystone, like most reliable equipment manufacturers, desire to KNOW for an absolute certainty, the grade—tensile strength—of the cables they use.

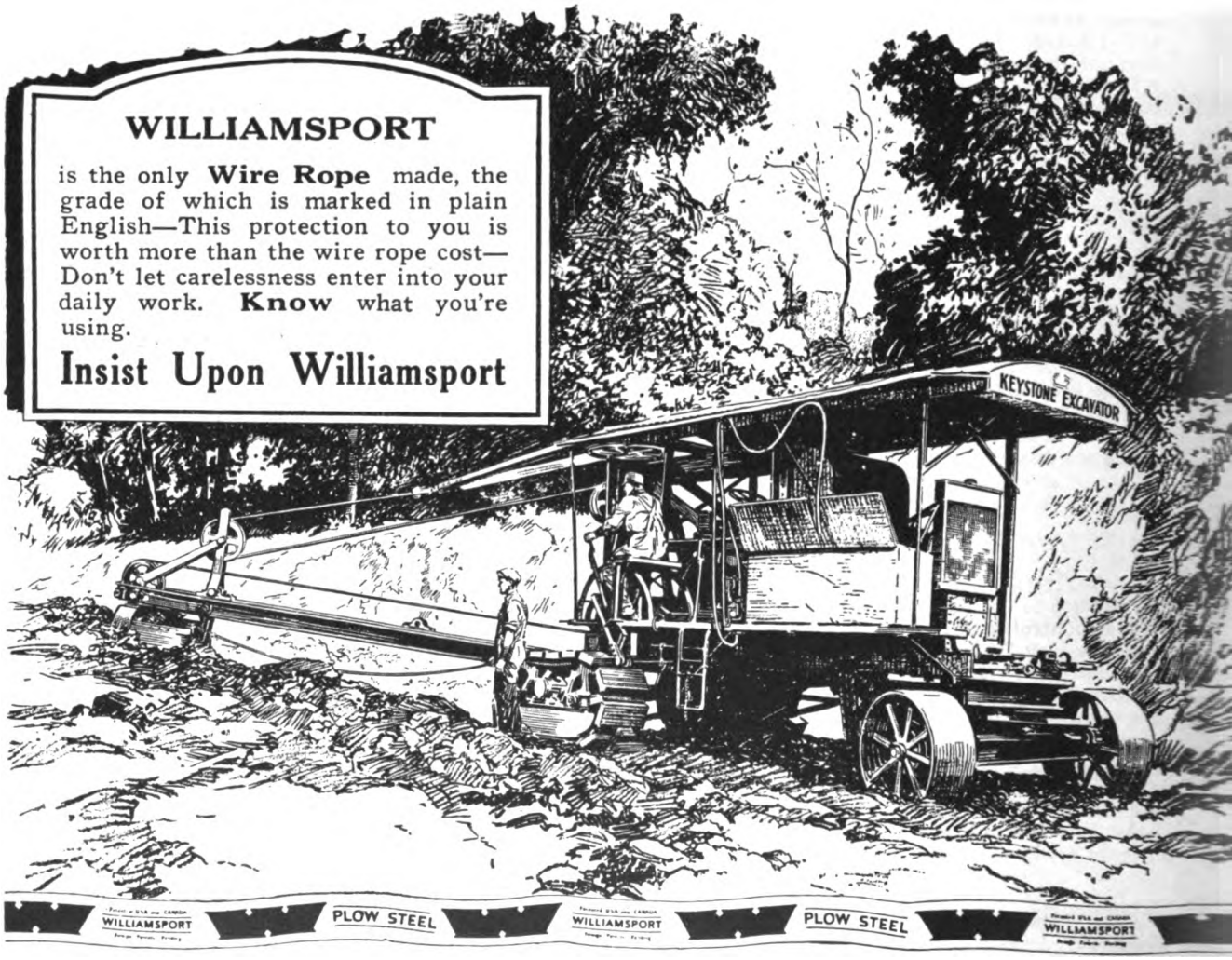
There can be no guesswork with KEYSTONE and there SHOULD be none with ANY manufacturer.

Careful engineers—men who prefer certainty to uncertainty—are demanding Williamsport Wire Rope on their operations for in this way only can they know beyond doubt the grade of rope they are using.

Manufacturers who thus equip their machinery are thinking of *your safety* more than the price they pay for the rope they use—They don't *shop*—They *specify*

WILLIAMSPORT

for YOUR protection.



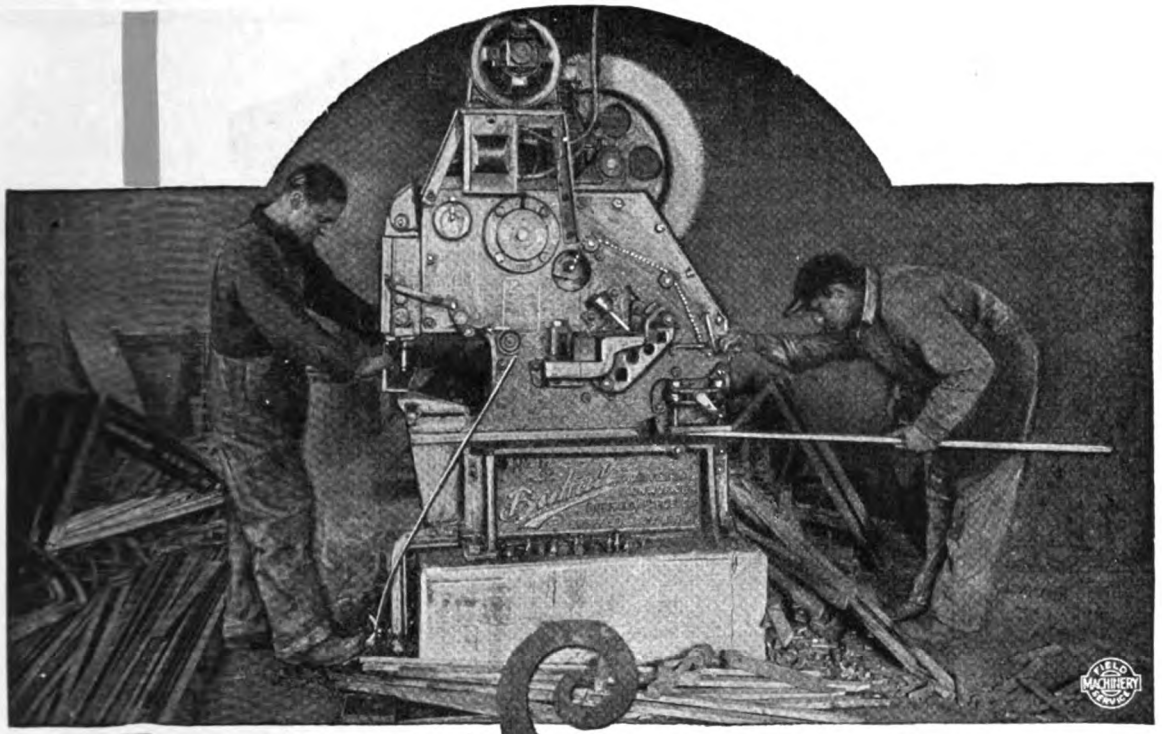
WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works: Williamsport, Penna.

Use MADESCO TACKLE BLOCKS—*They Stand the Gaff*

Gen'l Sales Offices: Peoples Gas Bldg., Chicago

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"Buffalo"

Universal Iron Workers for "all-round" usefulness

With its combination of punching, shearing, bar cutting and notching capacities on almost any structural shape, the Universal Iron Worker soon makes itself indispensable.

The Miele Manufacturing Company of Newark, N. J., keeps their No. ½ Buffalo Universal Iron Worker in service 48 hours a week performing a wide variety of shearing, punching and mitering operations on bar stock, steel plate, beams and channels.

In the photograph above one operator is shearing 1¾ x ¾ in. steel flats, while the other punches ¾ in. holes in 3 x 3 x ½ in. angle iron. The ironwork illustrated includes an andiron and a chimney ornament—but two of the many varied pieces produced by this company for general building work.

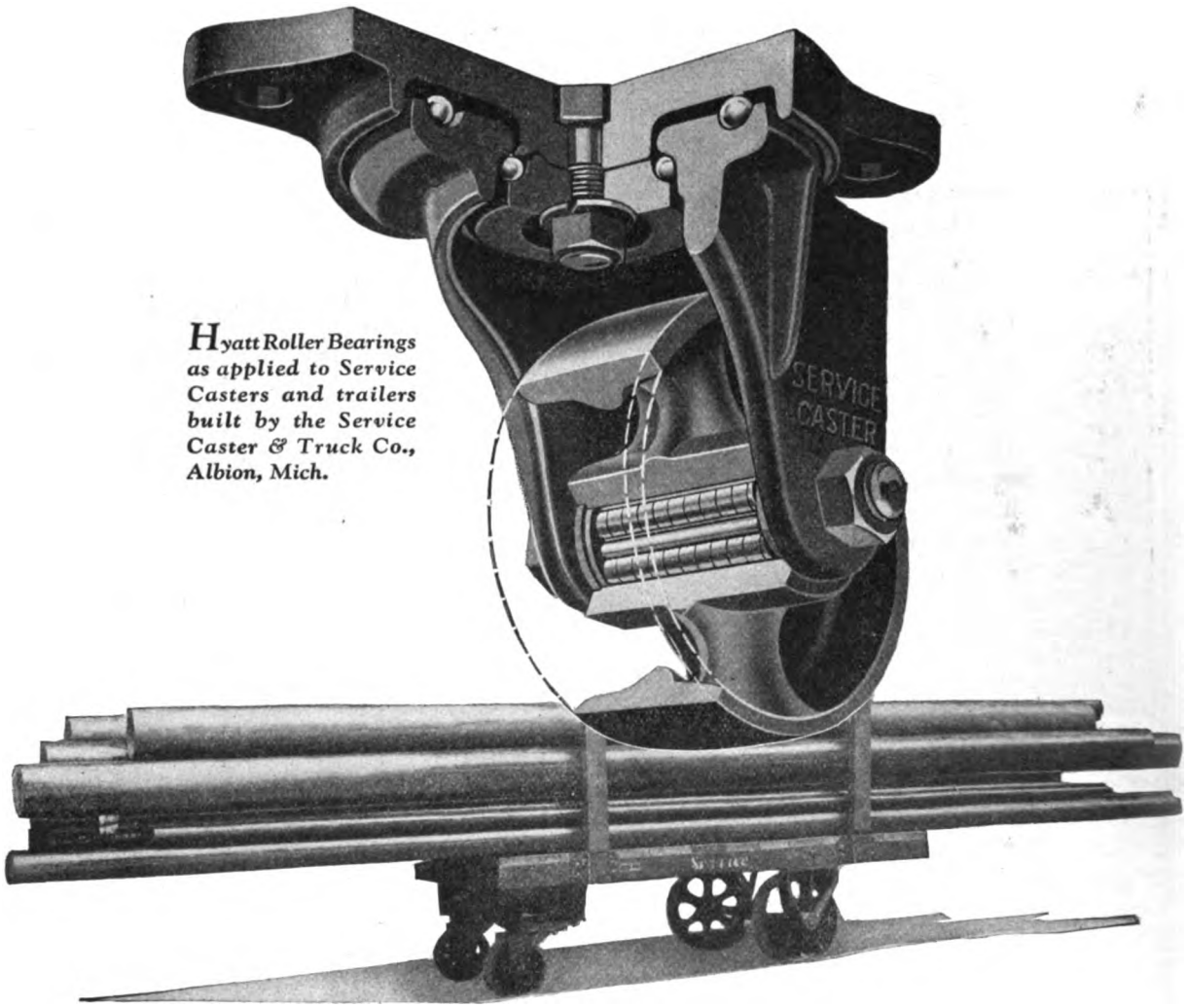
"Buffalo" Universal Iron Workers are built in three sizes—No. 0, No. ½ and No. 1½—to meet the requirements for working up different sizes of stock most economically. A request on your letter head will bring full information on the time and money saving possibilites of a "Buffalo" in your shops.

Buffalo Forge Co.

440 Broadway **Buffalo, N. Y.**

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Digitized by Google



Hyatt Roller Bearings as applied to Service Casters and trailers built by the Service Caster & Truck Co., Albion, Mich.

Long life— *and steady, money-saving service every day of it*

Hyatt Roller Bearings are built to endure. They guard your trucks and trailers against delays, breakdowns and irregular service. Even under the most severe conditions they can be depended upon to give ten to twenty years of steady, uninterrupted performance.

In a severe test with *SERVICE* casters, Hyatt bearings carried a load exceeding 3000 pounds over the roughest three mile course to be found near the *SERVICE* factory. Cobbles, street car and railroad tracks, and badly hacked concrete were encountered. Subsequent inspection showed the Hyatt bearings entirely unaffected by this abuse. The sturdy Hyatt rollers rotate with the wheels in a natural, easy motion. There is practically no friction or wear. Their ideal construction enables them to retain lubricant for longer periods—hence the infrequent need for oiling Hyatts.

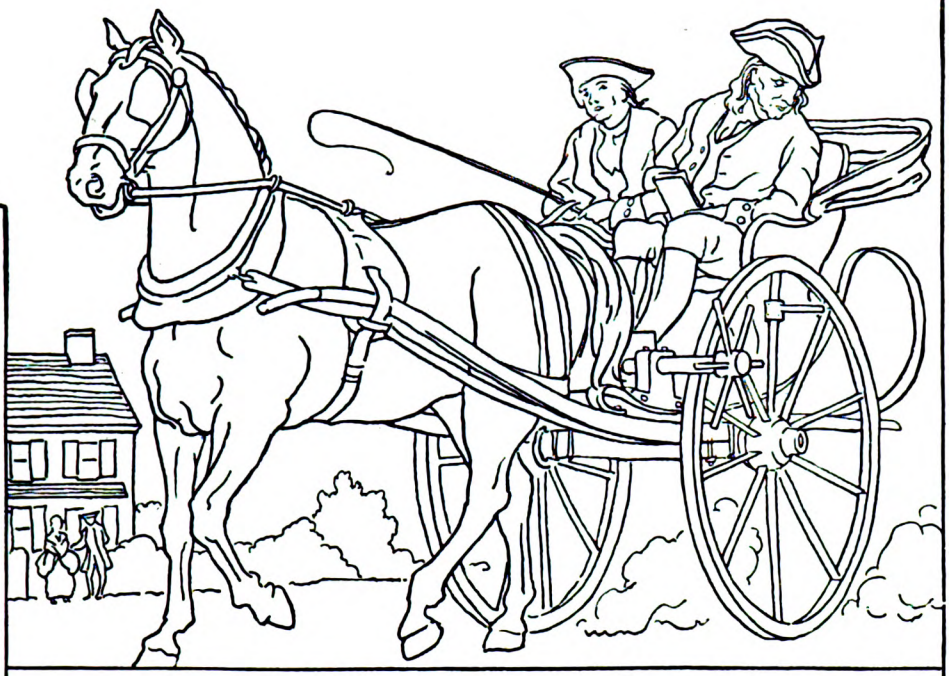
Keep your loads moving permanently, by specifying Hyatt Roller Bearings.

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO OAKLAND WORCESTER
PHILADELPHIA PITTSBURGH CLEVELAND

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

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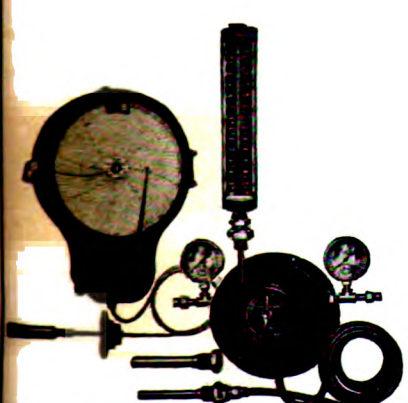
BENJAMIN FRANKLIN, *on the old Post Road from Philadelphia with a home-built device of his own making, marked off the miles and placed the milestones. The horse may not have traveled in the exact road center, the wheels may have wobbled, the device probably loosened as the journey progressed—we would hardly settle national boundaries or individual property rights on the same basis today*

When you sell any instrument of measurement it must be CORRECT

The difference of a degree means life or death in the sick room. The difference of a degree means success or failure in many an industrial operation. The manufacture, the sale, of an instrument of measurement entails heavy responsibility on the part of its maker, its seller.

The merchant who sells such instruments to the public may not have the time or the knowledge necessary to test and personally guarantee each instrument. But he can have assurance based on the tests men of science, of medicine, of industry, have subjected such instruments to—and be guided by their decision.

It is no accident that the great majority of such men prefer *Tycos*. They carry the guarantee of seventy odd years of manufacture and millions of dollars invested in plant and laboratory.



Taylor Instrument Companies

ROCHESTER, N. Y., U. S. A.

CANADIAN PLANT
TYCOS BUILDING, TORONTO

MANUFACTURING DISTRIBUTORS IN GREAT BRITAIN, SHORT & MASON, LTD., LONDON

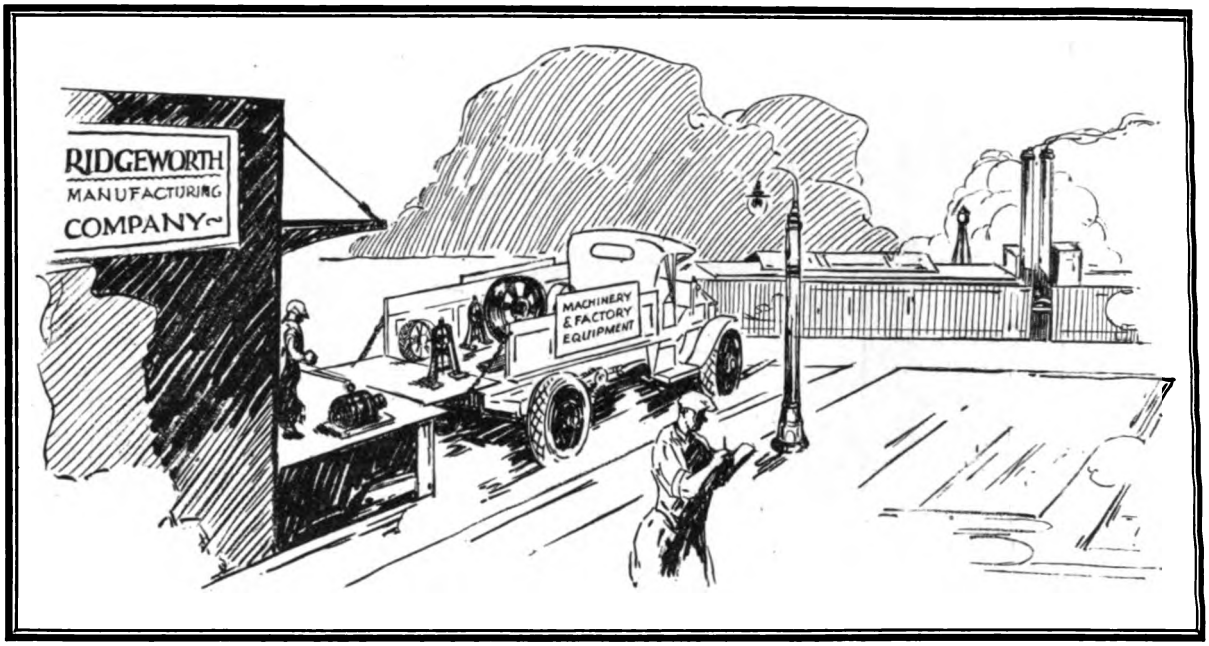
REG. U.S. PAT. OFF. Tycos ROCHESTER, N.Y.

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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For Nationally Advertised Industrial Equipment

Go to Your Mill Supply Distributor

HAVE you thoroughly investigated the lines handled by the machinery and mill supply distributor?

You will find that he represents a number of well known manufacturers whose machinery, equipment and supplies have built a reputation for reliability in every industry. In turn the mill supply distributor has been chosen by these various manufacturers because he has convinced them that he is in a position to give better service in your locality than can the manufacturer direct.

Thus the mill supply distributor not only gives you quicker and better service, but he can be relied upon for quality at all times.

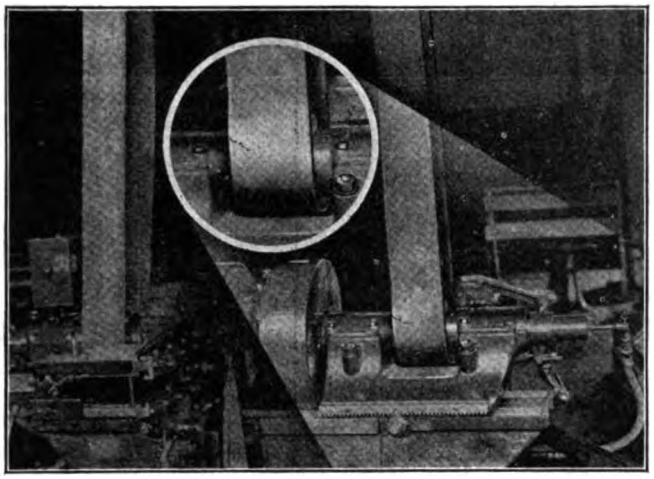
Buy from the Machinery and Mill Supply Distributor

One of a series of advertisements published in the interest of better understanding between the industry and the mill supply distributor

For product mentioned in this issue write Industry Illustrated

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SCHIEREN BELTS DO LAST LONGER



What is wrong with the belt in this picture?

Note how this belt is breaking down on the edge just because it is too wide for the pulley. The edge of the belt should not extend beyond the pulley face. In this case we would recommend a double belt narrower than the pulley and with the pliability characteristic of Duxbak.

Memo to the man who buys belting:

Some belts last longer than others—there's no doubt about it. You can take a Duxbak double belt and bend it around easier than you can any other just because it is more pliable. That, too, is why it lasts longer.

As for the other features, good workmanship and the best of materials speak for themselves.

Let us send you a copy of L. H. Hopkins' article, "Group Drives More Economical for Most Conditions."

DUXBAK BELTING

Chas. A. Schieren Company

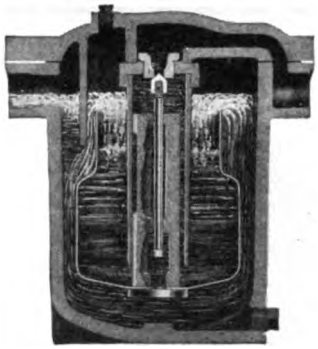
Tanneries: Bristol, Tenn.

Main Office and Factory
31 Ferry St., New York

Distributing Branches and Dealers in All Leading Cities Throughout the World

DUXBAK WATERPROOF LEATHER BELTING

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ILLINOIS Eclipse Steam Trap

No Other Trap Has This Feature

The valve action is SNAP action. Valve is either tight closed or wide open. Never cracked on seat. Wire drawing impossible.

Other Features: Can't blow steam or air-bind. No complicated levers—only TWO moving parts.

Shipped Prepaid on 60 Day FREE Trial

The Eclipse is not "just another steam trap." Its valve action makes it the OUTSTANDING Steam Trap of the Day! Test one on your "worst service."

Under ordinary conditions most any trap will operate reasonably well for a while, but—it is the severe condition—the *worst service*—that shows how an Eclipse will end your trap troubles.

This coupon brings prepaid an Eclipse Improved Steam Trap for 60 day free trial.

MAIL IT TODAY

ILLINOIS ENGINEERING COMPANY
21ST AND RACINE AVE., CHICAGO

Please ship prepaid an ILLINOIS Eclipse Trap for 60 day free trial. It is understood that this is to be of *no* expense to me and that after testing the trap I may return it WITHOUT QUESTION.

Size of pipe connections .....Trap capacity.....

Maximum steam pressure .....

Firm .....

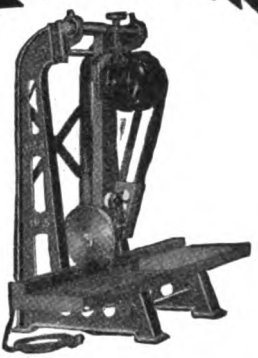
Address .....

.....

Signed .....Position .....

☐Send trap bulletin only.

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPO
CHICAGO



Save Hand Labor—Get a Smoother Job with This Saw

FOR saving hand labor in cutting long lumber into short, accurate lengths with perfectly squared ends, the H & A Portable Electric Swing Saw is unsurpassed.

A common laborer can do better work with this machine than the most skilled can do by hand. This saw will go through a board many times quicker than the hand saw. And it does a smoother job.

This well-built, guaranteed swing saw, like all portable bench machinery in the H & A line, is a self-contained unit operating from a lamp socket. It can be moved about quickly for use wherever needed. It is ideal in industrial plants, lumber yards, crating rooms and for carpenters and contractors.

The H & A line consists of this saw, the rip saw, band saw, swing saw, jointer and lathe, all portable.

Write for further details on this important line which sells through dealers.

HESTON & ANDERSON

613 W. Depot Ave. **Fairfield, Iowa**

Portable Electric H & A Woodworking Machinery Bench Machines

ESTABLISHED 1912

PLIMPTRUCK

B.E. SCRIVEN PATENTS

STABLE AS THE PYRAMIDS

The LIFT TRUCK with the Knuckled Steering Wheels



Here are four men—at least 680 pounds—all standing on the edge of a standard Plimpton truck,—still they can't tip it over.

These trucks are absolutely

Stable
Dependable
Durable

Let us tell you *why*.

Plimpton Lift Truck Corporation

National Distributor

C. A. GRAHAM
170 Broadway, New York City

Some good territories open

For products *issue write Industry Illustrated*

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...about *no account* Horsepower

IT strays up the flues in the form of unburned gases. It wanders away from poorly insulated pipes or surfaces in the form of heat radiation. It shuffles off in steam leakage. It shirks all along the line because it is not properly guided.

A startling amount of industrial horsepower, carefully raised from the coal pile, turns out "no account." It just never gets to work.

Making this "no account" horsepower get to work is a lot cheaper than creating new waste again and again.

Let a Johns-Manville power specialist go over your plant and show you how "no account" horsepower, now a large loss, can be changed into a large gain.

Johns-Manville Packings, Insulations, Refractory Cements, etc., help to transform your "no account" horsepower into the kind that helps pay dividends.

JOHNS-MANVILLE CORP., 292 Madison Ave. at 41st St., New York City
Branches in all large cities. For Canada: CANADIAN JOHNS-MANVILLE CO., LTD., TORONTO

Asbestos
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS

JOHNS-MANVILLE

PACKINGS; HIGH TEMPERATURE CEMENTS; INSULATIONS; ROOFINGS AND OTHER ASBESTOS PRODUCTS

SAVES HORSEPOWER

When writing advertisers please mention Industry Illustrated

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WHERE to PURCHASE MODERN EQUIPMENT

for Mill Shop & Factory

BEARINGS

Oilless Bearings—Bearings that Give Years of Service without wear are described on page 61 by The Arguto Oilless Bearing Company.

Ball Bearings—Keep Shafts free of Friction and wear. See page 33. The New Departure Manufacturing Company.

Roller Bearings—That Insure Long Life and Economical Service. See page T (Colored Advertising Section). Hyatt Roller Bearing Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Motors—A Small Alternating Current Motor for unusually hard service. Descriptive bulletins offered by Diehl Manufacturing Company. See page 113.

A Motor So Equipped with Ball Bearings that the life of it is greatly prolonged. Write for bulletin to Valley Electric Company. See page 78.

A Small Motor that gives long service is described on page 81 by The Master Electric Company.

A Push-button Controlled Motor with improved operating characteristics is described in Bulletin TR by The Triumph Electric Corp. See page 46.

A Motor Equipped with Timken Roller Bearings Plus—an automatic take-up is described on page 53 by The Howell Electric Motors Co.

Fractional Horse Power Motors are described on page B (See Colored Advertising Section) by The Domestic Electric Company.

A New Slant on Motor Oiling. See page M (See Colored Advertising Section). Lincoln Electric Company.

A Single Phase Motor, Type SCR, is described on pages 49-50. General Electric Company.

Motor Starters—Built in four sizes for AC Motors up to 7½ Hp. See page 75. The Cutler-Hammer Mfg. Co.

Portable Cord—For Delivering Electric Current is described in F (See Colored Advertising Section) by The United States Rubber Company.

Lights—Where and When Needed are described on page 118 by The American Fixture Company.

A Portable Light That Can Be Placed wherever necessary is described in Bulletin 501-S by The Appleton Electric Company. See page 63.

Grinders—And Equipment are Described in a new booklet—also a tap drill chart. See page 47. Wisconsin Electric Company.

Circuit Breakers—Are Described in 263 page booklet which may be had with the Handbook of the U-Relite. See K (See Colored Advertising Section). The Cutter Company.

MAINTENANCE

Paint—Red Lead Paint That Can Be used as a priming or finishing coat. See Goheen Corporation. Inside Back Cover.

Guarantee to Remain White Longest. Write for booklet "More Light." U. S. Gutta Percha Paint Co. See page 3.

Absolutely Waterproof and Weatherproof. See page 73. American Asphalt Paint Co.

Spray Equipment—Saving the Surface with a Binks Spray Gun is described on page 68 by The Binks Spray Equipment Company.

The Vortex Painting Method is described on page 35 by The Vortex Manufacturing Company.

Fans—A Man Cooling Fan that increases production is described in circulars offered by Robinson Ventilating Company. See page 114.

A Catalog describing Type ME Fan and its relation to better production is shown on page 113. New York Blower Company.

Water Tanks—An Elevated Tank that assures fire protection. Write for booklet. Chicago Bridge & Iron Works. C (See Colored Advertising Section).

Window Cleaners—That Clean Safely and Quickly is described on page 46 by The Gerson Stewart Corp.

Concrete Floor Hardener—L. Sonneborn Sons tell how to make Concrete Floors Last Longer. See page 37.

Corrugated Cans and Pails—Made of a Special Analysis sheet steel. Described on page 42. Witt Cornice Company.

Factory Furniture—Made of All-Steel is Described in Bulletin 357 of Standard Pressed Steel Co. See page 111.

Doors—An Automatic Door that lowers your insurance rate from fifteen to twenty-five per cent. See page 29. Richards-Wilcox Mfg. Co.

Metal Building—A Corrosion-resisting Alloy which insures life time service is described on A (See Colored Advertising Section) by The Maryland Metal Building Company.

Lighting—Two Hundred and Twenty-two operators work better under improved lighting. See D (See Colored Advertising Section). Industrial Lighting Committee National Electric Light Association.

Window Walls—See N (See Colored Advertising Section) Detroit Steel Products Company.

Unit Heating—Heat—as much as you want where you want it. P (See Colored Advertising Section). American Blower Co.

MATERIALS HANDLING

Conveyors—The Scraper Type Conveyors are described in the bulletin of The Jeffrey Manufacturing Company. See page 39.

Conveyors for all types of work and [illegible]ds of plants are described on page 122 by Lin[illegible]ov.

Conveyors of the pneumatic ty[illegible]ng of Granular Material. See J (See Colored Advertising Section). Dust Recovering & Conveying Company.

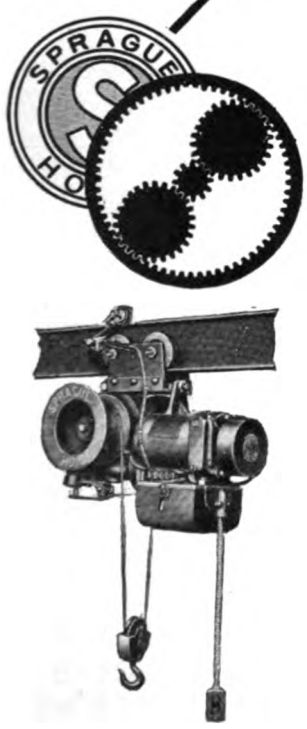
A New Catalog No. 327 of portable conveyors has been published by The Portable Machinery Company. See page 6.

That Facilitate Production and eliminate unnecess.

(*Continued on page* 110)

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Announcement



This is the ½ ton Sprague Electric Hoist with Push Button Control.

THE Shepard Electric Crane & Hoist Co. has purchased from the General Electric Co., the Sprague Electric Hoist business. This includes the right to manufacture and sell all Sprague Hoist products previously made by the Sprague Electric Works of the General Electric Co.

This business will be carried on without interruption, including the manufacture of Sprague Worm Gear Electric Hoists and Trolleys; Sprague Worm and Spur Gear Winches; and repair parts for all types of Sprague Hoists, Trolleys and Winches.

Sprague Electric Hoists are in wide use today; the Sprague name, well and favorably known, has been associated with electric hoists for the past 25 years.

We should appreciate your directing all correspondence and inquiries regarding Sprague products to the Sprague Electric Hoist Division of the Shepard Electric Crane & Hoist Co., at the address below.

SPRAGUE ELECTRIC HOISTS
DIVISION OF
SHEPARD ELECTRIC CRANE & HOIST CO.
30 CHURCH ST., NEW YORK, N.Y.

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As enthusiastically reviewed as a best seller



--but free

How the Trade Comments on Our Catalogue C

"You are always in the lead with something original and attractive."

"Beautiful, complete and something high for competitors to shoot at."

"Neatest job in the catalogue line I have seen in a long time."

"Surprised at the information you have given."

"First shovel catalogue that gives a complete description of various grades."

"Heretofore it has just been 'shovel.' Catalogue C describes the shovel and tells of the market for it."

"You have overcome a great difficulty for jobbers."

"It is certainly a work of art."

"Just a step ahead in merchandising shovels."

"A simplified method with a comprehensive price list."

"Most artistic supplement ever developed for a shovel catalogue."

"Attractive and displays your product in an intelligent and useful manner."

"Not only a work of art but very complete."

"Removes the 'bug bear' in ascertaining proper cost price on various models and patterns."

"We like the loose leaf idea."

"Just what shovel men have been waiting for."

"Fine and shows a lot of thought and hard work."

Catalogue C, everything about Wood, Stuart and Piqua brands, the best carbon steel shovels made, with prices so you can understand them at a glance. Copy of Catalogue C cheerfully mailed on request.

THE WOOD SHOVEL AND TOOL CO.
PIQUA, OHIO, U. S. A.

"The largest and most complete shovel ... world."

For produ... in this issue write Industry Illustrated

(*Continued from page* 108)

handling. Write for "Seven Economies of Logan Conveyors." Logan Company. See page 1.

Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company on page 118.

Trucks—A Lift truck that is stable, dependable and durable is described on page 106 by Plimpton Lift Truck Corporation. (C. A. Graham.)

"Snapshots of Sensible Savings" shows the way to lower handling costs by the use of lift trucks. See page 117. The Lakewood Engineering Co.

The Versatility of the Baker Tractors and Trucks is shown in a catalog offered by The Baker-Raulang Co. See page 79.

The Tri-Wheel Truck, the only one of its kind is described on page E (See Colored Advertising Section). Service Caster and Truck Company.

26 Different Models of Trucks in the Fairbanks Catalog. See page 40. The Fairbanks Company.

A Trailer and Handtruck for Every purpose. See the Lansing Co. Page 116.

Bulletin A-125 Describes a Heavy Duty "Wagon Type Steer" Trailer—Bulletin A-100 describes a Caster Type Trailer. See Mercury Manufacturing Company. Page 64-65.

Car Movers—That Move Heavily Loaded Cars are described by The Appleton Car Mover Company. See page 114.

A Car Mover that Saves Time in Moving Loaded and Empty Cars. The Advance Car Mover Company. See page 76.

Truck Wheels and Casters—Floor Protection afforded by the proper truck wheels and casters is described on page 121. Write for literature to Divine Brothers Company.

Wheels that Decrease Overhead and increase production fifty per cent. See The Metzgar Company. Page 80.

Casters that Make Rolling, Turning and Starting Easy are described in Catalog F-104. The Bassick Company. See page 59.

Scales—"Weigh While you Convey," described on page 79. The Merrick Scale Mfg. Co.

For Both Weighing and Sacking Loose Materials. See page 71. Richardson Scale Company.

Overhead Carries—A Mono-Rail System is described in a new booklet just off the press, entitled "Materials Handling." See page 113. The Louden Machinery Company.

A Duo-Rail System that conserves Space, Speeds production, solves difficult handling problems. Write for "The Atlas of Mechanical Conveying." The Atlas-Chicago Company. See page 5.

Electric Hoists—A Half-ton Sprague Electric Hoist with push-button control is described by The Sprague Electric Hoist Company. Division of Shepard Electric Crane & Hoist Company. See page 109.

For Quick Hoisting on Various Jobs see page 71. Roeper Crane & Hoist Works.

Write for the Book of Illustrated Economies and booklet 71-A. Shepard Electric Crane & Hoist Co. See Back Cover.

Chain Blocks—Ball Bearing Equipped Chain Blocks which make operation easy. Send for literature. The Yale & Towne Mfg. Co. See page 45.

Cranes—Catalog No. 200 Describing high quality cranes may be had on request. Whiting Corporation. See H (See Colored Advertising Section.)

A Small Portable Crane that is sent on 30 days trial described in Catalog IN. The Canton Foundry & Machine Company. See page 118.

Pressed Steel Equipment—A Complete Line of Pressed Steel Material Handling Equipment is described on page by The Powell Pressed Steel Co.

Carbon Steel Shovels—Are described in Catalog C of The Wood Shovel & Tool Co. See page 110.

POWER PLANT EQUIPMENT AND AUXILIARIES

Steam Traps—A Sixty Day Free Trial of the Eclipse Steam Trap is offered by Illinois Engineering Company. page 106.

Eliminating Waste in Steam Line. A Sarco is sent on days' free trial. Booklet R-284. Sarco Company page

(*Continued on page* 112)

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"HALLOWELL" ALL-STEEL Factory Equipment



These Tool Stands *make for faster work!*

With "Hallowell" All-Steel Tool Stands you move the tools to the job, instead of the job to the tools. Quicker. Easier. Broad open shelves—tools always in sight, no need of men spending time hunting the right one.

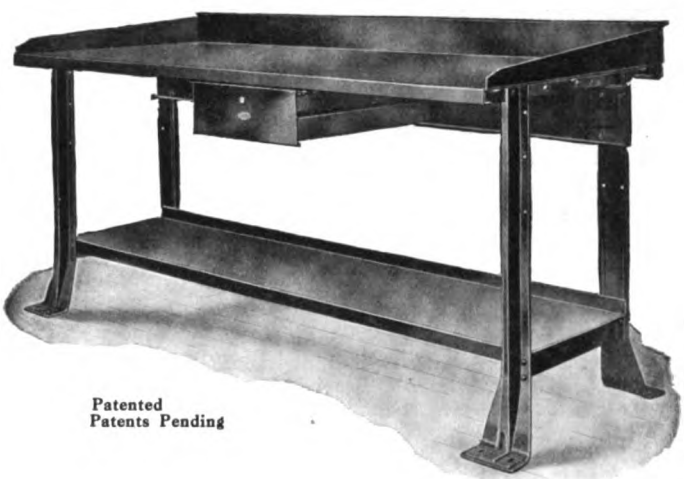
"Hallowell" All-Steel Drawers may be had, of course, when desired; so can sliding trays for smaller tools. Tool stands can be ordered with or without casters.

Ready-made Benches in all sizes, *cost less!*

"Hallowell" All-Steel Work Benches need no carpenter's time. Won't splinter. Can't burn. Stand up under loads that ruin ordinary wooden benches. All sizes. Always in stock. You can get them when you want them in any number, too!

If you prefer wooden tops "Hallowell" All-Steel Bench Legs are at your service.

Send for special bulletin No. 357—complete descriptions of "Hallowell" All-Steel Factory Equipment.



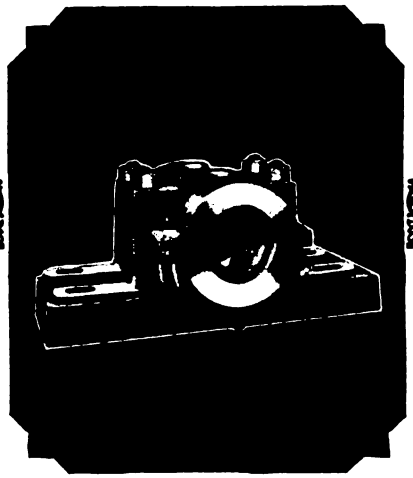
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Patents Pending

"Hallowell" All-Steel Shop Equipment is listed in the service manuals of Buick — Hudson-Essex — Chevrolet

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Self-lubricating Bearings and Pillow Blocks furnished split to facilitate erection. Of sufficient length to provide ample bearing areas. Bearing surfaces lined with anti-friction metal. Oilfeed grooves cut in the bearings assure proper lubrication throughout the bearing lengths. Laminated fiber shims between halves to compensate for natural wear. All bearing ends faced.

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This added Line makes Medart a more complete source for mechanical power transmitting machinery and allied products than at any time in its nearly 50 years of serving Industry. Ask for Bulletin on Timken-Equipped Line and for Catalog No. 43, with discount sheet, on all other Transmitting Equipment.

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Office and Warehouse in Cincinnati

Manufacturers of Power Transmitting and Kindred Machinery

MEDART

Everything in Line Shafting Equipment

(Continued from page 110)

Unions—A Free Trial Offer is made by E. M. Dart Mfg Company. See page 60.

Regulators—A Feed Water Regulator that puts boilers o an efficient basis is described in a catalog of The Chaplin Fulton Mfg. Co. See page 74.

Measuring Instruments—Instruments That Carry the Guar antee of Seventy-odd years of manufacture are describe by Taylor Instrument Companies on page 103.

Valve Reseating Machines—Slashes Valve Maintenance Ex pense. Described in Catalog 23 of The Leavitt Machin Co. See page 117.

Pumps—That Provide Greater Economies in Heating Equip ment. See page 8. Nash Engineering Company.

Insulation—Economies From Proper Insulation is Describe on page 107 by Johns-Manville.

Industrial Thermometers—A Complete Service by the Engi neering Staff is offered by The Industrial Division o The Moto Meter Company, Inc. See G (See Colore Advertising Section).

TOOLS. (Shop Tools, Saws, Files, Chucks, etc.)

Drills—For High Speed Drills, see page 81. The Standar Tool Co.

Twist Drills that give one hundred per cent servic Morse Twist Drill & Machine Company. See page 72.

The Six Famous Twist Drills are described on page 4 by The Cleveland Twist Drill Company.

Pneumatic Drills built for hard, continuous use. De scribed on page 55. Send for latest catalog to the Inde pendent Pneumatic Tool Co.

Saws—A Portable Electric Saw that saves hand labor described by Heston & Anderson on page 106.

A Shipping Room Saw that cuts crating costs 50% an sawing costs 90%. D. W. Onan & Sons. See page 54.

Cut Costs with a Parks Shipping Room Saw. The Park Woodworking Machine Co. See page 58.

Saw Blades—Facilitate cutting with Victor Blades. See pag 40. Victor Saw Works.

Wrenches—and Vises with special service features for pa ticular details. See The Trimont Mfg. Co. Page 38.

Of Chrome Vanadium Steel are described on Insi Front Cover. Bonney Forge & Tool Works.

Reversible Ratchet Type are shown on page 71 by T Lowell Wrench Company.

Screw Drivers—Built for Long Life. American Saw & M Co. See page 58.

Screws—That Facilitate Assemblying. The Allen Mfg. C See page 52.

Woodworking Machinery—That will handle the avera work of small plants and the bulk of the work of lar plants cheaper and better. Gallmeyer & Livingston See page 51.

Ironworking Machinery—For All-round Usefulness. page S (See Colored Advertising Section). Buff Forge Company.

Surface Grinders—Particularly Efficient on a wide variety small tools. Full particulars may be had from The Salle Tool Company. See page 60.

Threading Tools—Described on I (See Colored Advertis Section) by J. H. Williams & Company.

Files—Of Longer Life That Cut Faster. See page 34. S onds Saw & Steel Company.

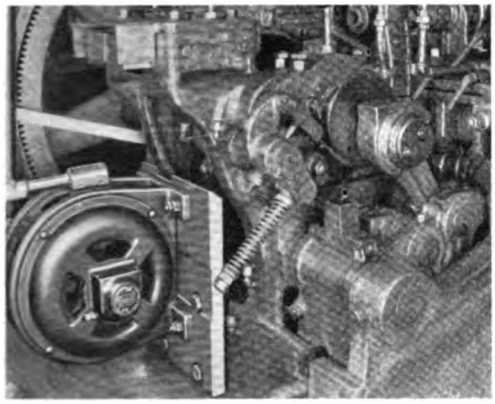
Vises—The Vise with the rib of steel. See page 76. Cha Parker Company.

Speed Indicators—That Can be carried in one's vest poc See page 57. The Brown & Sharpe Mfg. Co.

Dogs and Clamps—of exceptional stiffness and ten strength is described on page 66 by Armstrong B Tool Co.

(Continued on page 114)

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Diehl alternating current motor driving a heading machine in large forge plant provides a dependable supply of power.

Diehl alternating current motors are efficient, and dependable under unusually hard service.

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"Material Handling"
Just off the Press

This new book is packed full of information on material handling work. It shows the many different types of material handling equipment best suited for the work to be done. No well-posted executive will want to be without it.

Is the system you are now using the best possible for the layout of your plant? You can *not* be sure until you have seen this book. Could you save minutes on this or that operation? This book will show you how others are doing it.

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"Material Handling"
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INDUSTRIAL MONORAIL SYSTEMS
(for Overhead Lifting and Carrying)

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Man Cooling

FANS



Soon your workers will require air cooling apparatus. The hot weather days certainly cut down efficiency unless workrooms are made as cool as possible.

ROBINSON MAN COOLING FANS will prepare you for the dog days. They will help to keep production at the peak and will do more than anything else to hold up the morale of your entire force.

ROBINSON FANS are equipped with cast aluminum wheels which are also furnished separately for replacements. The wheels produce 15% to 20% more air at the same speeds with less power than any other fan of this type on the market.

Prepare now for the hot weather. Write for circulars and list of users.

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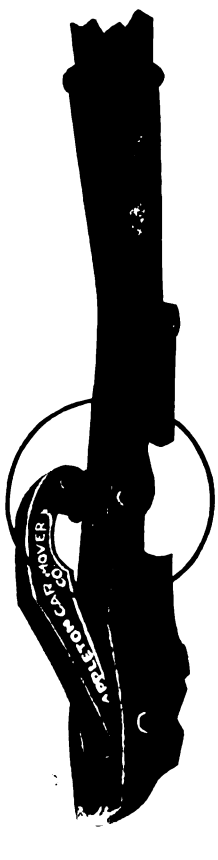
The moving of heavily loaded cars requires a great amount of power.

The very appearance of the Atlas Car Mover suggests power. Its scientific construction develops power, sufficient to move the heaviest cars and still have a margin of reserve.

Its positive grip spurs never fail to hold and assure perfect safety.

A locomotive as far as practical results go, it places cars with an astonishing speed and ease.

OUR POLICY IS TO SELL THRU THE JOBBER



The Famous

ATLAS CAR MOVER

Manufactured Only by

Appleton Car Mover Co.
Appleton, Wis.

(Continued from page 112)

TRANSMISSION EQUIPMENT (Including Belting)

Pulleys—Twenty-seven Years Experience in the Manufactu of Pulleys. See Pyott Foundry Company. Page 69.

2,194 Stock Sizes of Pulleys described in the booklet The Rockwood Manufacturing Company. See page 3

Pressed Steel Pulleys and Hangers that are light, rigi efficient and adjustable. See page 70. The Americ Pulley Company.

Speed Reducers—A Catalog Describing The Lewellen Tran mission for varying speeds is offered by Lewellen Mf Company. See page 119.

Making Speed Flexible. See Q (See Colored Advert ing Section). Reeves Pulley Company.

Catalog No. 26 describes the transmission of maxim power at minimum cost. W. A. Jones Foundry & M chine Company. See page 67.

Belting—The Cocheco Booklet tells the story of Coche Belting. Write for it. I. B. Williams & Sons. Page

That Lasts Longer is featured on page 105. Chas. Schieren Company.

"How, When and Where to Use Burmaline Belting," a treatise on belting. See page 2. Burrell Belting Co

Belt Treatment—That Keeps The Belt as Tight as a fid string. See page 51. Cling-Surface Company.

Belt Lacer—A New Lacer that laces both ends of an eig inch belt in one and one-half minutes. See L (See C ored Advertising Section). Clipper Belt Lacer Co pany.

Clutches—A Twin Disc Clutch that insures smooth starti continuous operation and complete release. Descril on page 115. Twin Disc Clutch Company.

The New Conway Disc Clutch and its ten salient tures are shown on page 56. Conway Clutch Compa

Flexible Shaft Equipment—Cost Cutting Uses for flex shaft equipment is offered in picture-story form by R Haskins Company. See 116.

Known the World Over for its strength and durabi See page 74. N. A. Strand Company.

Ball Bearing Hangers—Which Reduce Friction and cut consumption. Certified Survey No. 1777 is sent free request by SKF Industries, Inc. Page 4.

Pillow Blocks—Self Lubricating Bearings and Pillow Bl are described by The Medart Company. See page

Transmission Machinery—A Complete Line of Transmis Machinery is described in a new catalog by T. B. Wo Sons Company. See page 43.

MISCELLANEOUS

Sheet Metal Parts—Reducing Costs by the use of sheet m parts manufactured by The Breese Bros. Co. See 116.

Shipping Boxes—A Complete Shipping Box Consult Service is offered by Hinde & Dauch. See page 77.

Cleaning Material—Industrial Cleaning Materials and M ods are described by The Oakite Products Inc. Pag

Counters—A Full Line of Magnetic and Mechanical Cou for all machines is offered by The Veeder Mfg. Co. page 44.

Goggles—Welding and Cutting Goggles that eliminate of the injurious rays. Willson Goggles Company. page 51.

Pencils—Seventeen Black Degrees, Three Copying. scribed on page 119 by The American Lead Pencil pany.

Agitator Drives—For Every Purpose. See page 82. England Tank & Tower Company.

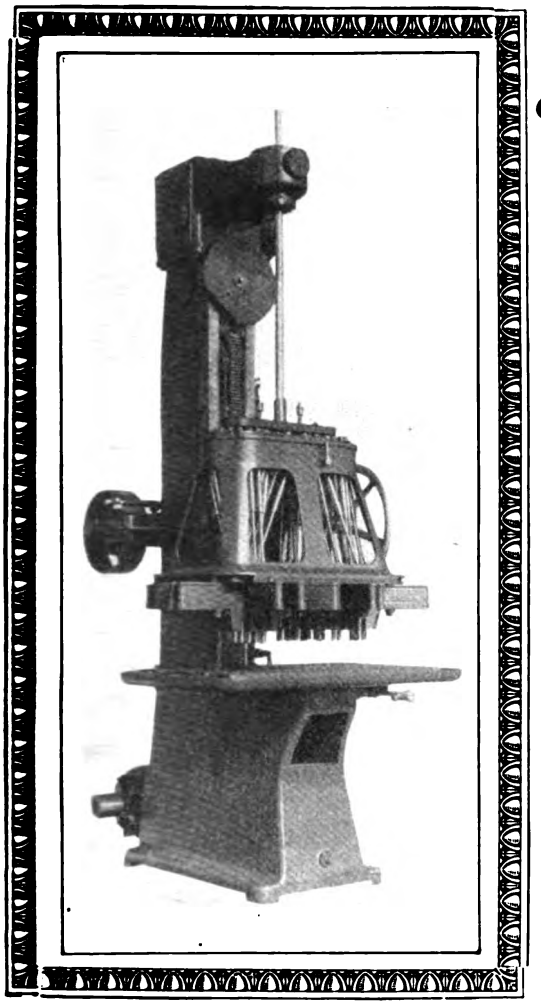
Brushes—A Better Wearing Brush for Every industri See O (See Colored Advertising Section). The O Mfg. Co.

Wire Rope—Insures Safety. See R (See Colored Adv ing Section). Williamsport Wire Rope Company.

Automatic Stools and Chairs—For Office, Shop and G Factory. See page 79. Vitek. Mfg. Co.

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TWIN DISC CLUTCHES

THE machine illustrated at the left—a Natco B12C Multi-Driller, is driven by belt or motor through a Twin Disc clutch mounted on the rear of the column.

Some of the advantages of driving production tools through Twin Disc clutches are:

Smooth, even starting at all times, whether under load or not, due to the flexibility of the clutch.

Continuous operation, due to the ease with which the clutch can be kept in perfect adjustment, and to its extreme dependability and durability.

Immediate, complete release at the will of the operator, or when arranged for automatic stops.

Fewer countershafts, pulleys and belts are needed when machine tools are equipped with Twin Disc clutches. The economies in new equipment and shop maintenance thus effected go a long way toward reducing production costs to the minimum.



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Los Angeles—Coast Machinery Corporation, 406 E. Third St.

Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Ave.

Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.

Tampa, Fla.—Motive Parts Co. of Florida, Inc., 708 Twiggs St.

Detroit—Whitney Brothers, 6464 Epworth Blvd.

New York City—E. George & Co., Broome & Wooster Sts.

Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie St.

Cleveland—James R. Howell, 6715 Quimby Ave.

Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.

Buffalo, N. Y.—Edward W. Rode, 45 A. St.

TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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A Booklet for Executives



Cost Cutting Uses for Flexible Shaft Equipment in Picture Story Form.

Suggests many economical uses for Casting Grinding, Metal Pattern Making, Die Grinding, Auto Body Building and Repairing, Wire Brushing, Cotton Buffing, Polishing, Etc.

There are hundreds of ways in which metal working plants can produce much better work at a 10 to 50% lower cost. WRITE FOR BOOKLET and SPECIAL BULLETINS.

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It can be simplified to a considerable extent and a real savings can be effected by the adaption of

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This is especially true when you are considering the replacement of iron castings with sheet metal parts.

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Stamping, Forming, Drawing, Blanking, Punching

Send us a Blue Print or a Pencil Sketch and we will show you how to reduce your present costs.

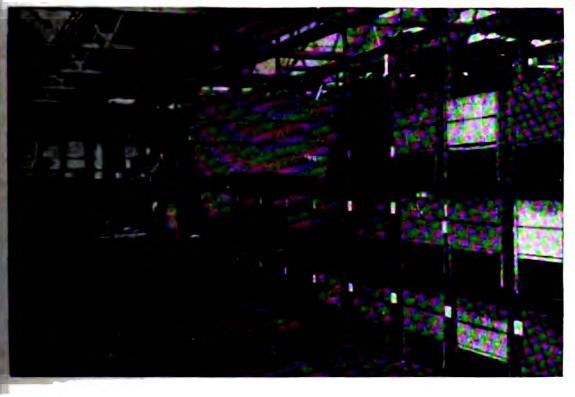
See Data A. S. M. E. Condensed Catalogue of Mechanical Equipment, also Chemical Engineering, McRae-Hendricks, Sweets Engineering, and Thomas Catalogues.

THE BREESE BROS. CO., Cincinnati, Ohi

For ... ertised in this issue write Industry Illustrated

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"I'll Raise You"



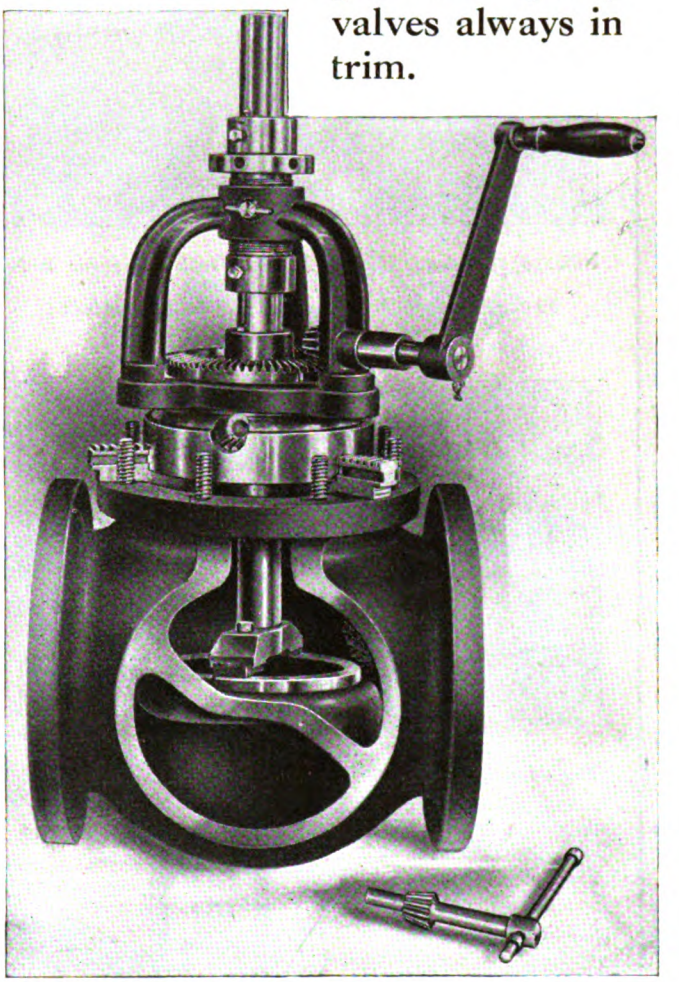
That's what a Lakewood Tier Lift Truck says to any load under 6,000 lbs. Former losses in high cost of handling are recovered and your production sheet is on "velvet" once again.

Lakewood Tier Lifts are designed to handle loads of any shape or size ordinarily found in the modern industrial plant. There is a truck in our line to fit your particular need. Why not let us explain the savings it can make for you? If not that—at least send for the illustrated booklet "Snap Shots of Sensible Savings" and see for yourself how modern plants are answering the question of high cost of labor and storage space.

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Engineering Company
Cleveland, O.

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Catalog 23 tells you all about a Dexter Outfit for keeping globe, gate and pump valves always in trim.



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British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne

Valve Reseating Dexter Machines

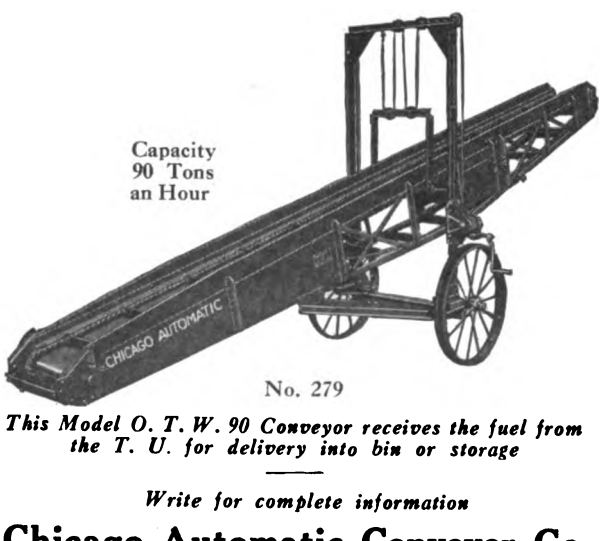
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CHICAGO AUTOMATIC

Conveyors and Track Unloaders Made Possible a Ton a Minute Car Unloading

Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use
90 tons an hour is the capacity of both machines



The Model T. U. goes under any car and handles all classes of fuel

This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable conveyor

982 Old Colony Bldg. Chicago

Representatives in All Principal Cities

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street

LIGHT

where and when needed

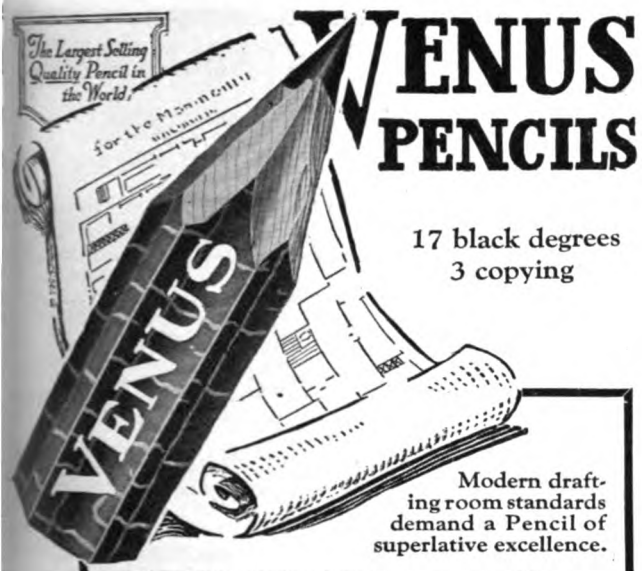
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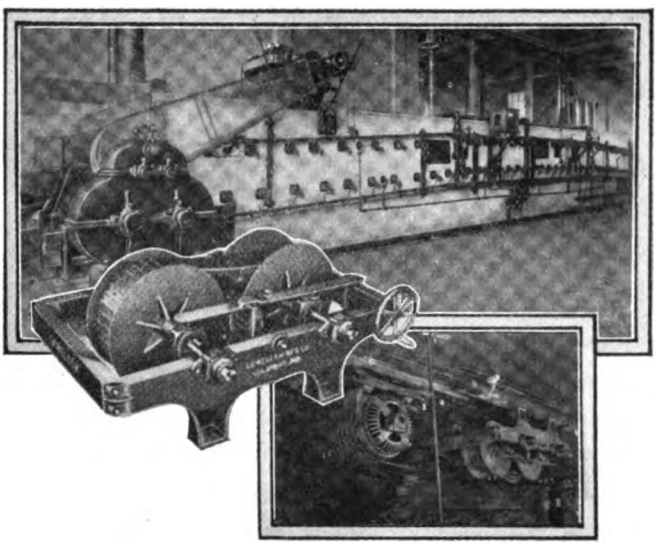
for less money than any other castor made.

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they swivel and roll very easily under heavy loads and will render you a long and satisfactory service.

Write Today for illustrated catalog, showing many sizes, a castor for every purpose.

PIONEER CASTER & MFG. CO.
Elkhart (26 Years Caster Experience) Ind.



LEWELLEN TRANSMISSIONS

Where varying Speeds are needed—

In many installations where Lewellen Transmissions are regulating and controlling speeds, the unit is placed on the ceiling. In some on one of the walls, or even on the floor.

No matter where it is installed, it works with equal dependability and economy.

Letters like this one tell the story. A customer writes, "We have used the Lewellen Transmission for years and it has been entirely satisfactory, and we have not required a single repair part."

Lewellen Transmissions are so designed that speed can be regulated to a fraction of an R.P.M. and all changes are made gradually from fast to slow and slow to fast.

No matter what industry you are in, if speed control, regulation or reduction is required, let us show you what Lewellen Transmission can do for you.

Write for catalog.

LEWELLEN MFG. CO.
Columbus, Indiana

There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN
Variable Speed
TRANSMISSION

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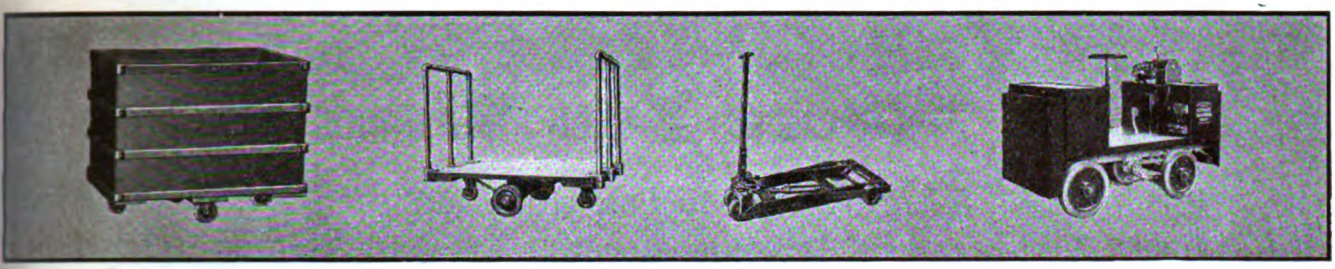
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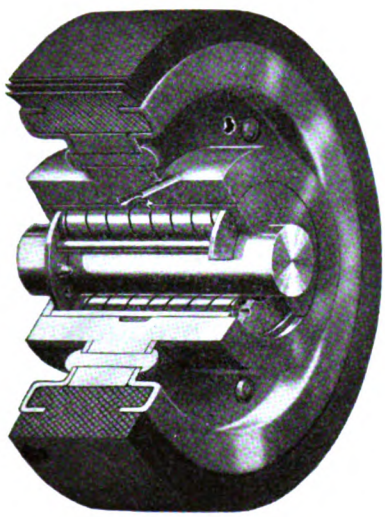
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DIVINE CANVAS CUSHION TRUCK WHEELS and CASTERS



Canvas Cushion Wheel with Swivel Steel Caster





Canvas Cushion Wheel with Rigid Steel Caster

DIVINE Canvas Cushion Truck Wheels are a positive protection to the finest floors. The tires of these wheels are composed of segments of canvas compressed under high pressure and held between steel side plates. Thus a "Cushion" of canvas is produced for the tread, which will not scratch or mar floors of the most delicate materials.

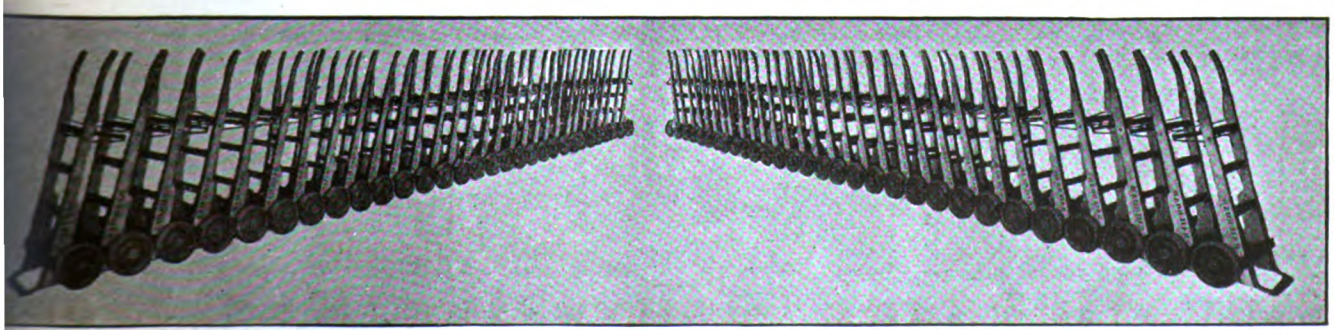
Divine Canvas Cushion Wheels are far superior to rubber tired wheels, because rubber tires chip, stretch and come off, or are torn to pieces within a short time. Divine Canvas Cushion Wheels are practically indestructible, do not deteriorate, and will last for years. The canvas cushion cannot stretch, spread, soften or change shape; cannot become chipped or torn; is not affected by hot or cold temperatures, or by oil or grease. Divine Canvas Cushion Wheels are the most durable, economical and dependable protective tread truck wheels ever manufactured.

Moreover, these Canvas Cushion Wheels are practically noiseless in operation. They are widely used in all classes of institutions where maximum silence is essential.

There are Divine Canvas Cushion Wheels and Casters made for every type of truck wheel service; for store, library, office, hotel, hospital, factory, warehouse or terminal trucks; for hand trucks, platform trucks, trailers or lift trucks; for portable equipment and for many other special purposes.

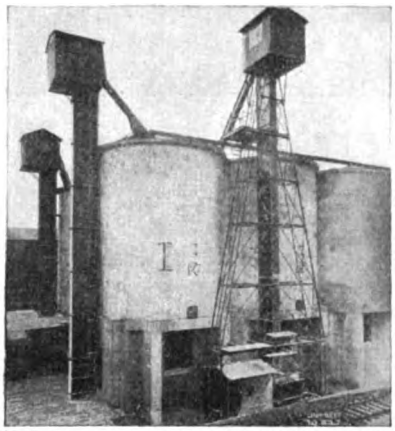
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Divine Brothers Company
INCORPORATED
Utica, N.Y.



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Moving Things—from Where They Are to Where You Want Them





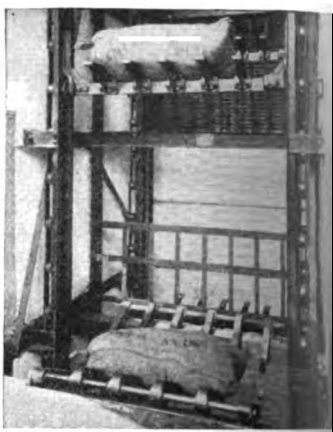




CUT production costs, and increase output by using Link-Belt Conveyors for handling your materials.

All kinds of products are being built today on the Link-Belt "progressive assembly conveyor" plan; and where this is not practicable, our time-saving, trouble-saving elevators and conveyors help the workers speed production and reduce "expenses."

No two installations are exactly alike—all are somewhat "different." Let our experienced engineers make suggestions.









Link-Belt Equipment

Elevators and Conveyors for all materials. Assembly conveyors for automobiles, Food Products, everything made in quantity in the factory. Foundry Sand Handling and Mould Conveyors. Bucket Elevators for Coal, Ashes and all materials. Coal and Ashes Handling Equipment. Crawler Cranes, Crawler Loaders, Portable Conveyors. Chains—wheels—elevator buckets and all elevator and conveyor accessories.

Send for Catalog.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery

CHICAGO, 300 W. Pershing Road — INDIANAPOLIS, 200 S. Belmont Ave. — PHILADELPHIA, 2045 Hunting Park

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Birmingham, Ala. - - 229 Brown-Marx Bldg.
Boston - - - - - - 1103-4 Statler Bldg.
Buffalo - - - - - - 554 Ellicott Square
Cleveland - - - - - 527 Rockefeller Bldg.
Denver - - - - - - 520 Boston Bldg.
Detroit - - - - - - 5938 Linsdale Ave.
Huntington, W. Va. - Robson-Prichard Bldg.
Kansas City, Mo., R.436, 1002 Baltimore Ave.
Louisville, Ky. - - - - 249 Starks Bldg.
New Orleans - 504 New Orleans Bank Bldg.
New York - - - 2676 Woolworth Bldg.
Pittsburgh - - - - - - 335 Fifth
St. Louis - - - - - - - 3638 Olive
Wilkes-Barre - 536 Second Nat'l Bank

H. W. CALDWELL & SON CO.:—Chicago, Western Ave.: 17th & 18th Sts.: Dallas, Texas, 1221 Mercantile Bank Bldg.: New York, 2676 Woolworth Bldg.

LINK-BELT MEESE & GOTTFRIED CO.:—San Francisco, 19th and Harrison Sts.: Los Angeles, 361-369 So. Anderson St.: Seattle, 820 First Ave., S. Portland, Ore., 67 Front St.: Oakland, Calif., 526 Third St.

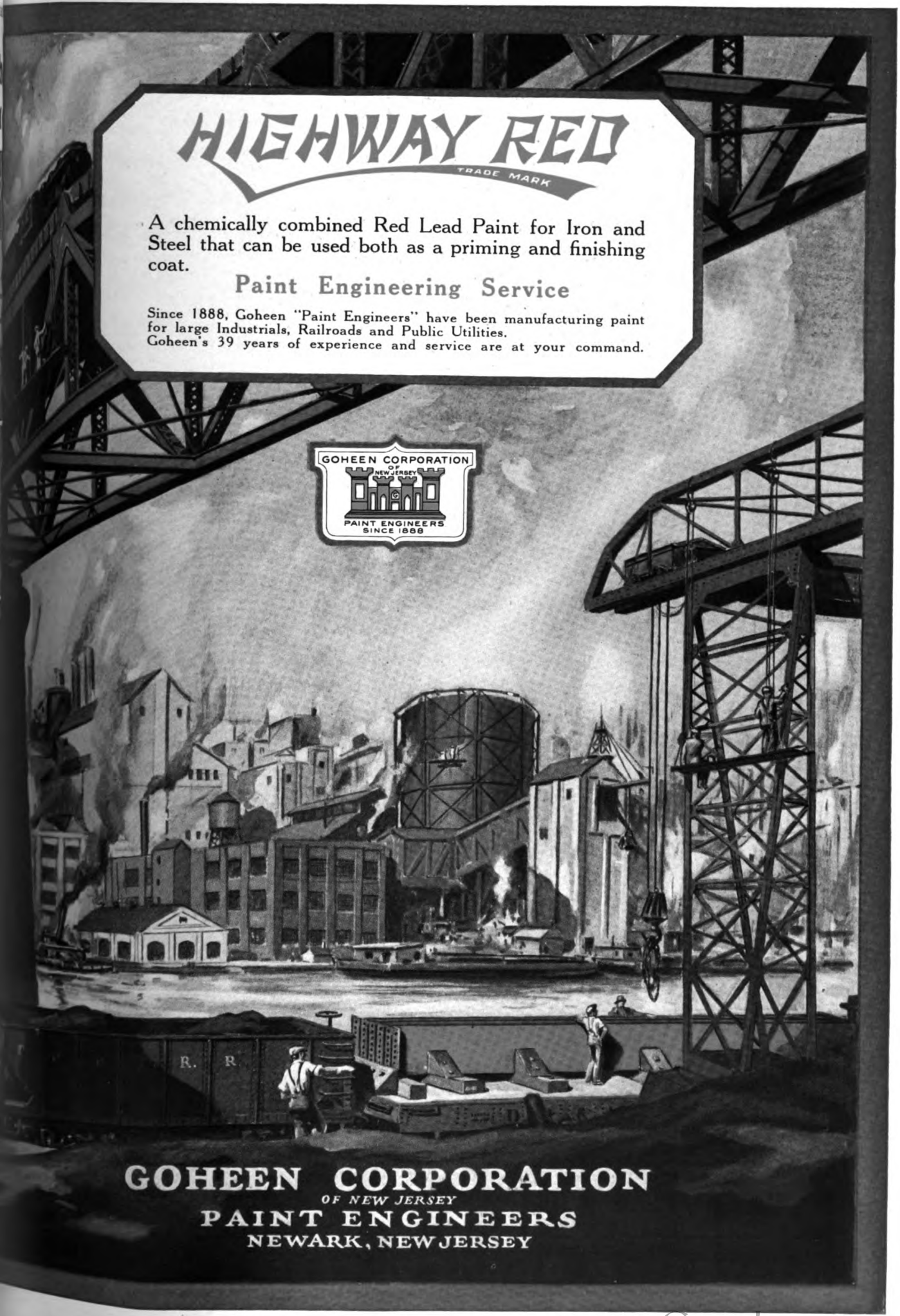
In Canada—LINK-BELT LIMITED—Toronto and Montreal.

LINK-BELT

Elevating and Conveying Machine

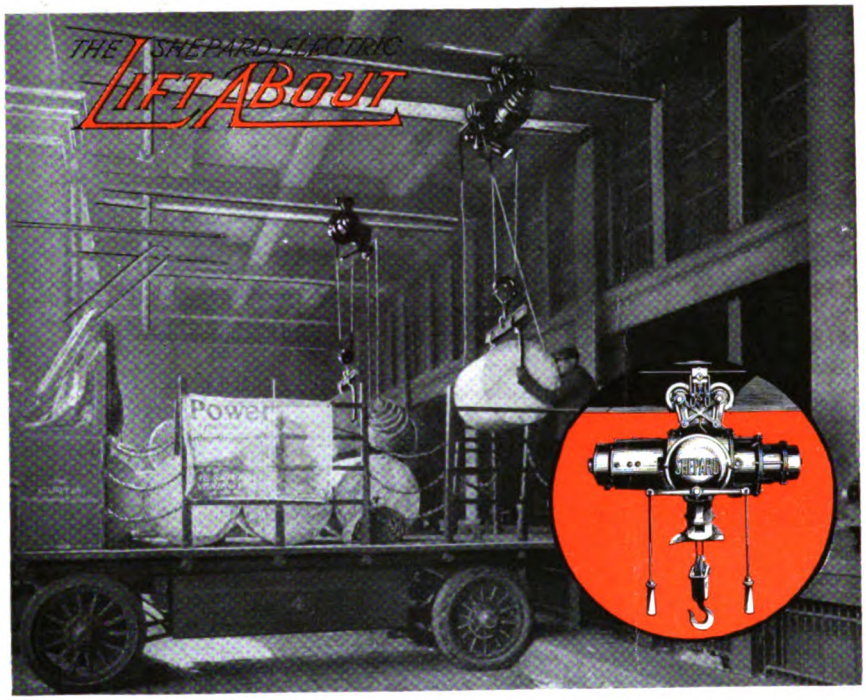
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EILERT PRINTING COMPANY, INC.
316-326 W. 39TH ST., NEW YORK



THROUGHOUT American Industry, this sturdy little electric hoist is saving time and labor in no end of lifting and load-moving operation.

It speeds up production schedules, improves working conditions, and is ever ready for service—24 hours-a-day if necessary.

This hoist is typically Shepard in every detail, with its Balanced Drive, enclosed unit construction, automatic oil bath lubrication and other features that provide a material handling service at exceptionally low cost.

The savings listed at the right are indicative of the economies that may be carried to your plant. Now is the time to investigate.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.

SHEPARD
ELECTRIC CRANES & HOISTS

Largest Manufacturers of Electric Hoists in America

Branch offices are maintained in principal cities

Shepard Economies

For you, savings like these:

"Six men and $7,000 yearly saved."
American Frog & Switch Co., Hamilton, Ohio.

"Hoist saves 15 man-hours daily."
Cincinnati Terminal Warehouse Co., Cincinnati, Ohio.

"Hoist and man equals four men with chain hoists."
National Foundry Co., Inc., Brooklyn, N. Y.

"One hoist saves $2,600 yearly on one job."
The Liquid Carbonic Co., Chicago, Ill.

"Process speeded up 50%; $6,000 saved yearly."
Thomas Gregory Galvanizing Co., Brooklyn, N. Y.

"Hoist saves $1,330 yearly in labor."
The Crystal Tissue Co., Middletown, Ohio.

"$1,500 in labor saved yearly; does work in one-tenth the time."
J. H. Day Co., Cincinnati, Ohio.

"LiftAbout three times as fast as old chain hoist."
Columbus Bolt Works Co., Columbus, Ohio.

"$14,000 yearly saved with 5 hoists."
Joseph P. Cattie & Bros., Philadelphia, Pa.

"Production increased over 25%."
Natl. Enameling & Stamping Co., Granite City, Ill.

"Two hoists save labor of three men."
Electric Power Equipment Corp., Philadelphia, Pa.

"Handling costs cut in half."
Dicks-Pontius Co., Dayton, Ohio.

WRITE FOR

The "Book of Illustrated Economies," which shows in picture and text, how LiftAbouts create real savings in nearly a hundred industries, handling all kinds of material,

and

Booklet 71A, the new Floor Operating Electric Hoists catalog, which gives the complete story regarding the complete line of Shepard floor operated electric hoists.

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ay 15, 1927

G. & Q. R. R.

25 Cents

Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

Reduce Costs and Increase Profits

"Reduce Costs and Increase Production," was the slogan of industry a few years ago.

"Reduce Costs and Increase Profits," is the cry today.

To do either of these the modern executive must keep step with new developments and improvements such as are described and explained in the columns of INDUSTRY ILLUSTRATED from month to month.



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BONNEY *CV (Chrome Vanadium)
No. 4 Sample Kit

*CV is a Bonney trademark registered in the U.S. Patent office

$2.50



Three Bonney C-V (Chrome Vanadium) double end Right Angle Wrenches with openings to fit the six most popular size S. A. E. bolts. The wrenches are designed with a ninety degree angle of opening and "pear shaped" jaws for work in close quarters.

They are well balanced, comfortable to the hand, and are guaranteed to be stronger than the bolts which they fit.

This is an introductory kit and the price complete is less than the cost of the three wrenches in the kit, if purchased separately.

Attractive Discounts to Dealers

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

BONNEY WRENCHES
Chrome~"CV"~Vanadium

REG. U.S. PAT. OFF.

BONNEY FORGE & TOOL WORKS, ALLENTOWN, PA.

Please send me one of your No. 4 Sample Kits for which I am attaching remittance for $2.50

*Name*_____

*Address*_____

PATENTS PENDING CHROME VANADIUM REGISTERED AUGUST 11, 19

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AC Spark Plug—another user



Upper Left: Three lines of Logan Gravity Conveyors, each containing four tiers of rollers, carry AC Speedometer parts to assemblers' benches and finished product to packing. *Upper Right:* Trays of AC Spark Plugs being carried via Belt Conveyor from assembling to packing department. *Lower Right:* Logan Slat Conveyor suspended from ceiling brings trays of parts into assembling department. Gravity Rollers convey parts to next operation.

IN *New York or New Zealand*—AC Products are known and sold! Specified by over two hundred of the world's leading automotive manufacturers and handled by dealers everywhere . . . . Only by the application of the most modern plant equipment has this tremendous production been possible. Outstanding among AC's cost-cutting equipment, Logan Conveyors are eliminating handling waste, reducing time between operations and each year preventing breakage far in excess of their purchase price . . . . Whatever your business, Logan Conveyors can doubtlessly increase your capacity, cut your payroll, improve your plant morale and materially widen your profit margin. Write today for *"Seven Economies of Logan Conveyors"*—it will not obligate you.

Logan Co.
INCORPORATED 1889
(Formerly THE DOW CO.)
LOUISVILLE, KY.

Offices in Principal Cities



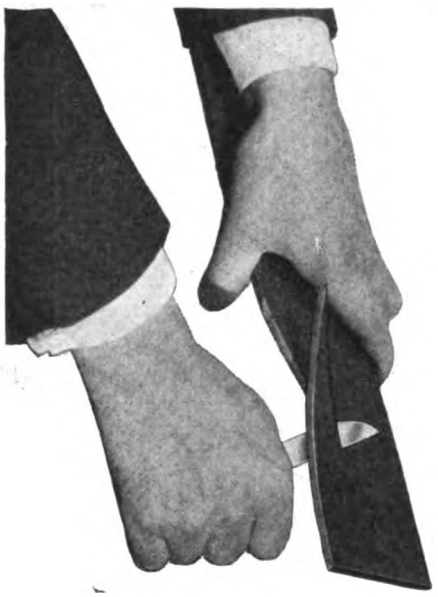
AC SPARK PLUGS, Air Cleaners, Oil Filters, Speedometers and Gasoline Strainers—standard equipment on thousands of fine automobiles for very much the reasons that Logan Conveyors are standard equipment in industry—proven dependability and the workmanship and materials that assure permanent economy. *Buick, Cadillac, Chandler, Chevrolet, Chrysler, Essex, Hudson, Jewett, Nash, Oakland, Oldsmobile, Pontiac, Star and Flint*—a few of the many cars factory-equipped with AC Spark Plugs.

Logan Conveyors
LOUISVILLE

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BURMALINE BELTING

Toughness Test Number 2

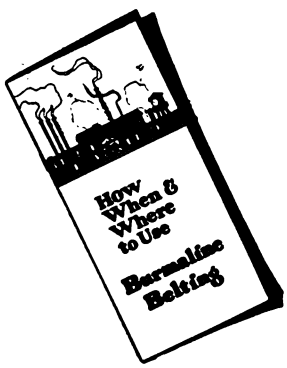


The Whittle Test

One of the best ways in which to test the toughness of a belt is to make a WHITTLE TEST. That is, attempt to whittle the belt as shown above.

This clearly demonstrates that a BURMALINE BELT is a tough, homogeneous belt and you will find that the way BURMALINE cuts or whittles is in sharp contrast to any other type of belting used for power transmission.

Send for a sample of BURMALINE. Take a sharp knife and try to whittle it. Try the same thing with similar pieces of other belting. There is no soft, cheese-like cut to BURMALINE. It takes a SHARP KNIFE and considerable strength to whittle it. Although being tough, BURMALINE BELTING possesses the desired pliability so necessary to a long lived, low initial and ultimate cost belt.



SEND FOR THIS VALUABLE BOOKLET. It will give you the inside story of BURMALINE: What Makes It So Tough, Types of Drives Recommended, Who Uses It, What They Say About It, and many helpful hints about belting.

Install a BURMALINE BELT. It will quickly make friends and convince you of the economy of more installations.

Your Jobber's Salesman Will Tell You More

BURRELL BELTING COMPANY

Manufacturers of Burmaline Belting—Alfalfa Belting—Ebony Transmission and Conveyor Belting—Universal Belt Oil and E-Z Grip Transmission Lining for Ford Cars and Trucks

416 South Hermitage Ave., CHICAGO, ILL.

The Market Place

MANY a need for a new machine—for a hoist, truck, or conveyor—for a change in transmission lines—or for some new appliance in the power plant that will lower costs—has been met by a glance through the advertising pages. It is the market place of industry.

In order to save time look on page 110 where the "Where to Purchase" section starts. Here the products are classified and arranged so that you can easily turn to the equipment required and receive valuable data describing it.

Harvey Conover Jr.
Business Manager.

Industry Illustrated

Published Monthly by

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"It's painted with Barreled Sunlight

..yet the finished job cost no more!"



LUSTROUS — smooth — white. Guaranteed to remain white longest. Proof against flaking—resistant to dirt—easy to wash—Yet costs no more!

How is it possible? Why does Barreled Sunlight with all these advantages actually cost no more on the finished job than many paints priced less per gallon?

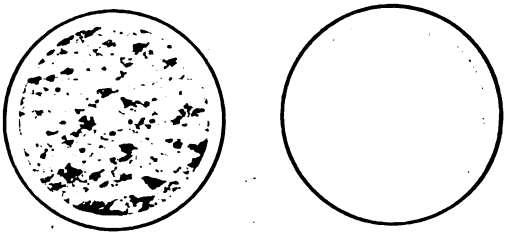
Only by breaking away from all established formulas and methods of making paint, which resulted in the exclusive Rice Process, could such quality and economy be combined in one product.

It is this exclusive Rice Process of manufacture that gives to Barreled Sunlight, not only the qualities of the finish itself, but the extreme "hiding power" and ease of flow that makes *less paint* and *less labor* necessary to do a given job. This is economy where economy counts the most.

* * *

We would like to send you our free booklet which shows, more in detail, why thousands of industrial plants find Barreled Sunlight by all odds the most practical interior paint from every point of view, including cost.

U. S. Gutta Percha Paint Co., Factory and Main Offices, 5 Dudley Street, Providence, R. I.—Branches: New York, Chicago, San Francisco. Distributors in all principal cities.



Ordinary Flat Finish White Paint — Barreled Sunlight

The microscope shows why Barreled Sunlight remains clean longest

These photographs of paint surfaces were made through a powerful microscope. The astonishing contrast shows why Barreled Sunlight is so easy to keep clean. Smooth and unbroken, it resists dirt and washes like tile.

What Users say:

The Nashawena Mills, at New Bedford, Mass. — "Your paint not only spreads better but seems to go further than any paint we have ever used."

The General Fire Extinguisher Co., Auburn, R. I.—"Our specifications called for three coats of lead and oil, but the work was done with one less coat, your claim that two coats of Barreled Sunlight would give a white and more solidly covered and durable surface proving true."

The Great Western Laundry, Chicago— . . . "We checked up and found Barreled Sunlight was much cheaper than our previous painting job done with a paint much under your price."

The Grennan Bakeries, Inc., of Detroit—"We find that Barreled Sunlight retains its whiteness . . . can be washed like tile, and can be easily applied, so that it actually costs less than any other paint we have ever used."

Barreled Sunlight
Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

Please send me your booklet "More Light," and a panel painted with Barreled Sunlight.

Name.....

Street.....

City.....*State*.....

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Ease up on your line shafting and you ease up on your overhead



FRICTION seldom makes its presence felt in the plant. It usually manifests itself on the company's books, under the headings power, labor and oil. It was so in the case of one of the big cotton mills of the South.

For many years, its miles of line shafting had been turning on plain bearings. Occasionally, these bearings ran hot and demanded immediate replacement. They required oiling every week. They added to the power load. They kept overhead up and production down.

Then, SKF Self-Aligning Ball Bearing Hangers were installed.

Bearing burn-outs were eliminated for all time. Lubrication was necessary only twice a year. Adjustments, due to the settling of the building, were eliminated by the self-aligning feature of the bearings. 53.04 H. P. was cut from the power load. The saving effected the first year paid for one-half of the entire SKF installation!*

Why not let an SKF engineer convince you that it is costing more to KEEP plain bearings in your plant than to REPLACE them with SKF anti-friction bearings?

*Skayef Certified Survey giving full details of these savings sent on request. Ask for your copy — today!

1736

SKF

MARKED

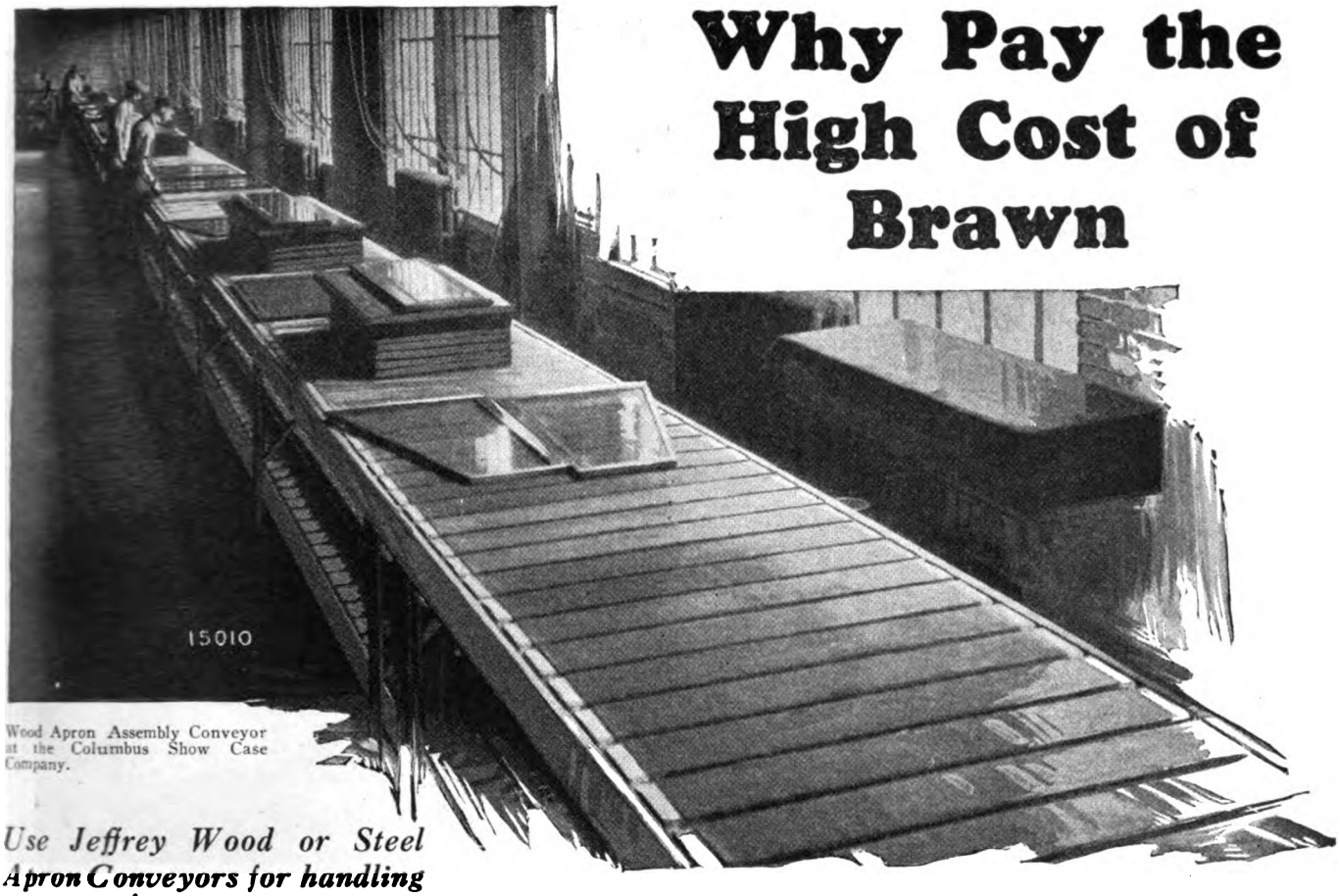
Self-Aligning HANGERS *Ball Bearing*

SKF INDUSTRIES, INC. — Madison Ave. at 34th St. — NEW YORK CI

For products this issue write Industry Illustrated

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Why Pay the High Cost of Brawn



Wood Apron Assembly Conveyor at the Columbus Show Case Company.

Use Jeffrey Wood or Steel Apron Conveyors for handling bulk or package material through the processes of

Assembling
Annealing,
Heat Treating
and Tempering,
Cooling,
Drying,
Roasting,
Inspecting,
Picking and
Transporting

LABORIOUS hauls and tedious handling of materials by the worker are no longer necessary nor are they profitable.

Simplify your material handling tasks by mechanical methods and you will turn them into efficient and economical operations that will make your invested dollars pay a higher dividend. Labor thus released can be placed at more profitable work.

Ask Jeffrey Engineers for specific information about mechanical handling installations that are profitably meeting problems similar to yours.

The Jeffrey Manufacturing Company
946-99 North Fourth St., Columbus, Ohio

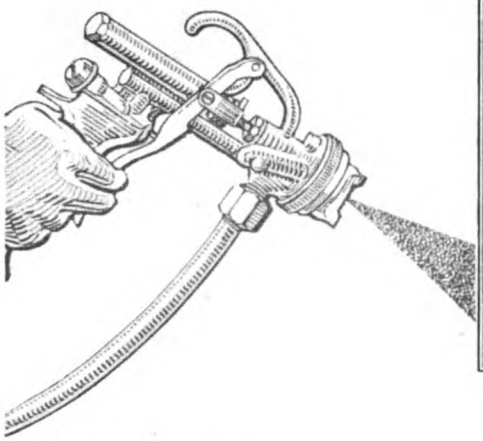
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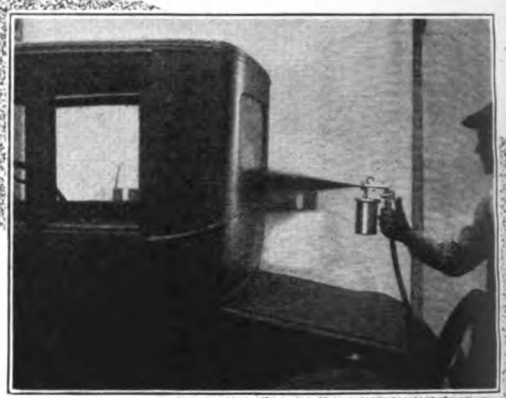
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Modern Methods and Equipment

For Mill, Shop & Factory

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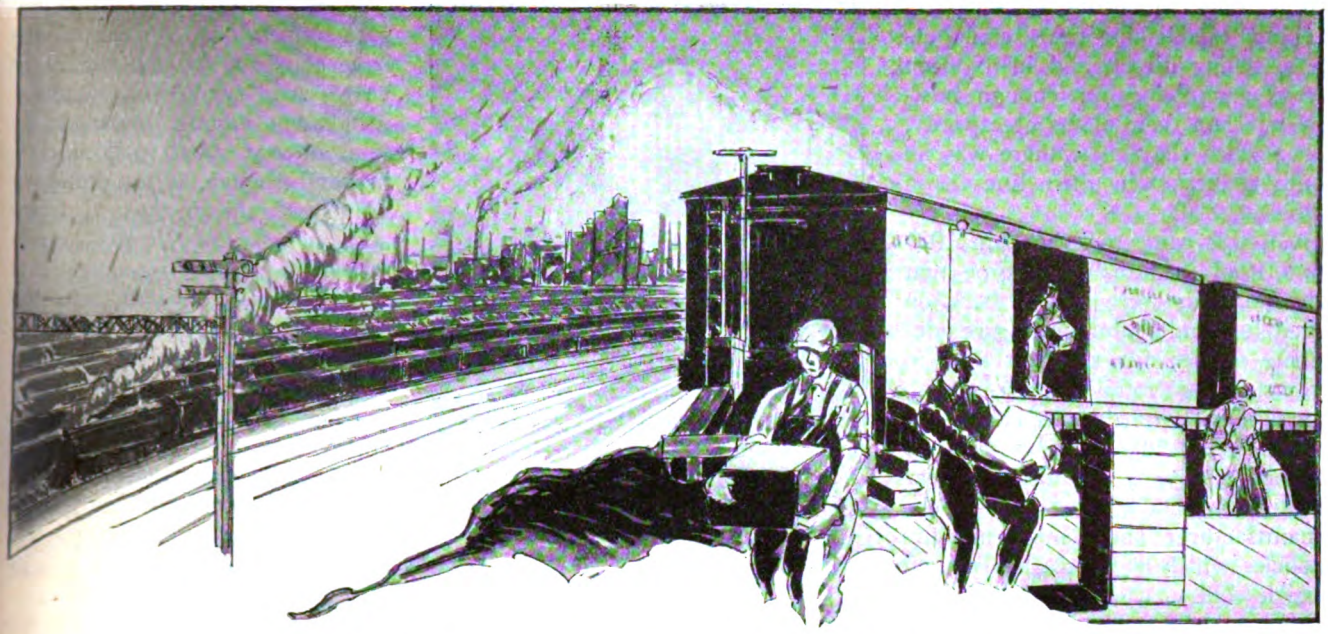
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"At present there are two underlying conditions which affect all merchandisers; whether they are retailers, jobbers or manufacturers. First, we are in a period of fairly stable markets, and second, we are enjoying rapid and dependable rail deliveries."

Hand-to-Mouth Buying

A Discussion of the Pros and Cons of "Provident Buying"

By Galen Snow

Manager, Sales Promotion Department, Greenfield Tap & Die Corporation

THE other day the editor of a publication asked me, "In your opinion, is Hand-to-Mouth Buying being carried too far?" My answer was "Yes and No." To me it seems as though one might as well ask, "Is automobile selling being carried too far?" or "Do we eat too many bananas?" As I see it, this question so often asked indicates a failure to grasp what Hand-to-Mouth Buying, so-called, really is, and the economic factors which have brought it about. The majority of discussion has dealt too largely with its symptoms and too little with its causes.

To begin with the very term Hand-to-Mouth Buying seems to carry some invisible reproach, to brand its adherents as being small, not forehanded, sort of duffers in the merchandising field. This is unfortunate, but that it is fairly general will not be doubted by anyone who has devoted some time to a study of the subject. Actually, the individual establishment which is not studying ways of decreasing inventory and speeding up turnover, is very likely to be headed for the rocks.

At present there are two underlying conditions which affect all merchandisers; whether they are retailers, jobbers or manufacturers. First, we are in a period of fairly stable markets, and second, we are enjoying rapid and dependable rail deliveries. It seems obvious that while these conditions persist, jobbers, retailers and consumers will continue to buy for immediate needs only.

Increased manufacturing costs can normally be passed on to the consumer; also taxes, increased selling expense, credit losses, etc. The significant thing about Hand-to-Mouth Buying is that it travels the other way. It acquired its name and first received attention from merchandising circles during and after the 1921 buyers' strike. The consumer originated the movement, and probably surprised himself profoundly by its immediate and spectacular success. Having once tasted power he was loath to lose it and developed his buying habits in the direction of maintaining better control over his sources of supply. The consumer was unconsciously aided by the manufacturer who was finding himself forced to establish intensive selling methods to dispose of his product. The weaker organizations especially were restraining in every possible way

"Hand-to-Mouth Buying is here to stay, make no mistake about that," says the author of the accompanying article. Then he proceeds in an interesting manner to tell how the practice originated; what effect it is having on the retailer, the jobber and the manufacturer, and concludes by outlining briefly what the wise business man is doing to keep step with the times, to the end that he might cut costs and increase profits.—The Editors.

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to get sales, by cutting prices, over-selling, establishing new retail outlets, selling direct, and in a dozen ways scrambling for enough business to run their plants at capacity, even when they knew there was an overproduction in their lines as a whole.

All this came to a head in 1921 and 1922 just about the time that the railroads were getting back on their feet and beginning to give adequate service for the first time in years. The retailer was able to avail himself of this improved service. He could reduce his stock by turning it over more times in a year and thus make a profit, which the manufacturer had denied him by policies which had caused a reduction in his margin per article sold.



"The housewife who previously bought fifty pounds of sugar at once was now buying five."

What happened?

Up to this time it had been the retailer who was supposed to sense the requirements of his market. In many lines he ordered spring and fall and it was up to him to guess what his customers would want six months or a year in the future. All the manufacturer did was to acknowledge the order, enter it in the factory, make up the goods and ship them. If the retailer had guessed wrong, why, that was too bad—for the retailer.

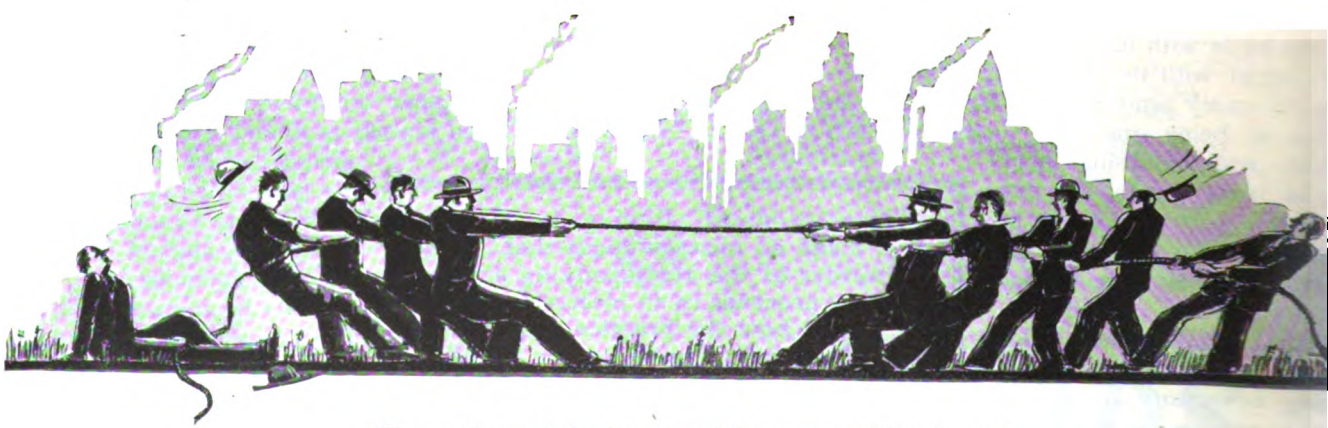
What is the situation today? Instead of buying for six months or a year from date the retailer's purchases are to fill his current needs, or at best, his needs of next month. Why? Not because he wanted to buy that way but because he had to to keep in black ink. His position had been weakened by increased competition and diminished margins and at the same time he was wrestling with the consumer's profound change in buying habits. The housewife who previously bought fifty pounds of sugar at once was now buying five. Paterfamilias, who always got all his coal in before cold weather, now was ordering in a ton or two at a time, and so it went.

Another fundamental change in buying habits is installment purchasing, and it touches practically every seller of goods or services. Obviously the demands upon the average weekly income resulting from the purchase of furniture, automobiles, washing machines, vacuum cleaners and the like are in the aggregate tremendous. Recent estimates have placed it as high as $500 per year. And while it is doubtful if installment buying has reduced the total amount spent for food, clothing and shelter, it has profoundly influenced the method of buying such necessities. It has certainly lent point to the pronouncement of a well known business man—that competition is no longer between individuals, but between industries. We see daily how installment purchasing has opened the doors to a host of industries who are clamoring loudly and often with pronounced success for the consumer's dollar. It is reported that over 80 per cent of the country's automobiles, for example, are sold "on time."

And so the retailer found himself at the same time tending to receive smaller and smaller orders for his goods and having to stand up under more and more high pressure salesmanship, cut-price competition, and house-to-house canvassing. He was between the devil and the deep sea. One day there was a new voice—"Turnover! Presto! the retailer's troubles were to be over. "Sure buy dozen lots every week instead of gross lots every three months—hold out for the same price and make twelve times the profit, because you only have to invest one-fifth the capital." And it has been the salvation of the retailer in more than one line.

The idea spread like wildfire. Used first as a selling argument by aggressive concerns anxious to see their line substituted for others on the dealers' shelves, it struck such a responsive chord that everybody took it up. As much as at Christmas time one can find everything from a pair of overalls to a pipe wrench daintily laid out in holly covered boxes.

It was not long before the manufacturer discovered that turnover was a two-edged sword. He had taught the retailer to analyze his stock from a new angle, and the retailer was doing the job mercilessly. Out of the general overhauling of lines and trade practices came Hand-to-Mouth Buying; the direct and obvious result of the "turnover" preaching of the manufacturers.



"The weaker organizations especially were straining in every possible way to get sales, by cutting prices, over-selling, establishing new retail outlets, selling direct, and in a dozen ways scrambling for enough business to run their plants to capacity, even when they knew there was an overproduction in their lines as a whole."

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It hit the jobber next. He discovered a tremendous growth of his broken lot department. This was not so good. "It's all right to give good established customers the privilege of buying less than a full case once in a while—we have to give some service—but this is going too far. Why some orders are all less than case lots! What's more, they want them delivered too, and worse, they want them right off!"

What to do? First a lot of time and energy were expended trying to convince the retailer that a practice which was putting him back on easy street was bad, morally wrong, wicked in fact, only a step removed from murder and rape!



" 'I thought you told us that if we authorized that new conveyor for packing purposes you could reduce your force'. 'I did,' says the merchandise manager, 'but last week we had 3,263 orders to handle and our weekly average up to January of this year has been between 1,900 and 2,150'."

The retailer's reaction to all this was negative. He just didn't react at all. "All right," said the jobber. "We'll start sending these little orders into the manufacturer for direct shipment—let him absorb the handling cost. He won't mind because he'll be glad to get business on any terms."

Pretty soon the manufacturer's merchandise manager was called on the carpet to justify the expansion in his payroll. "You've got seven extra men in the shipping room and nine clerks upstairs and business is only 2 per cent. ahead of last year. I thought you told us that if we authorized that new conveyor for packing purposes you could reduce your force." "I did," says the merchandise manager, "but last week we had 3,263 orders to handle and our weekly average up to January of this year has been between 1,900 and 2,150."

Most manufacturers then took the obvious step (to them) of "educating the jobber to increase the size of his orders," in which they were just as successful as the jobbers had been with the retailers—which is to say they weren't successful at all. Finally—they realized that they were up against something entirely outside their experience, and that a drastic readjustment of their whole business structures and organizations would be necessary in order to meet the new situation.



"The alert manufacturer stopped wasting his breath in futile discussion of this Hand-To-Mouth Buying phenomenon and began to study how his organization was handling it."

Today the average manufacturer's profits are directly proportional to the intelligence with which he has faced this situation and the energy which he has displayed in organizing and planning his business to operate in the face of these current conditions.

The manufacturer eventually grasped the fact that the current method of buying is not seasonal, or temporary, but that it has a sound economic basis. He realized that some pretty thorough introspection was going to be necessary if he was to continue to make a normal profit. The alert manufacturer stopped wasting his breath in futile discussion of this Hand-to-Mouth buying phenomenon" and began to study how his organization was handling it. How about these extra clerks and packers? Some way must be found to pay their wages except by taking them out of net profits. A good part of his thinking was as follows:—He must become more alert all along the line. He must organize to study his market. Getting down to details he must reorganize his business internally so that he can handle smaller orders at a profit. There are any number of organizations whose average order has decreased in value one-half, three-fourths or even nine-tenths since 1918, and yet they have made no special change in their method of handling orders with a view to reducing the cost of handling. This condition eats into profits tremendously and for some reason is not sufficiently appreciated by many manufacturers, particularly small and medium sized ones.

Coincident with this has been a vast increase in government control which has complicated bookkeeping systems to such an extent that unless great care is taken it actually costs more per order now to handle the small orders than it formerly cost to handle the large ones. The manufacturer must face and solve this situation if he expects to continue to make a satisfactory profit on his investment. The management that can't see this will eventually be bowed out and stockholders will put in a management which can. That's one angle of the situation, and a rather new one with which most manufacturers have to wrestle. The manufacturer differs from the wholesaler whose business has always rested on the filling of orders and the placing of orders with the result that he has been trained to continually watch these costs and keep them to the minimum; whereas with the manufacturer the filling of orders has been an incidental in his total cost, and his attention has tended in the direction of reducing manufacturing and general costs, with the result that his merchandising costs have been overlooked.

The most important function which has been shifted from the retailer's shoulders to the manufacturer's is the sensing and forecasting of the final market. No longer does the salesman go out spring and fall. No longer do the retailers guess at their customers' needs. National advertising and brand advertising took some of this load. Hand-to-Mouth Buying has removed the last of it—they now leave it to the manufacturer, thank you! He not only has to sell the consumer through his advertising, but he has to guess the degree of the consumer's preferences in advance, for now the retailer only carries a limited stock and builds his own stock to suit. It isn't the expense of carrying stocks that hurt today—most manufacturers can manage that—it's the pain that comes from overestimating a market, from seeing goods spoil or go out of style or otherwise become obsolete. Manu-

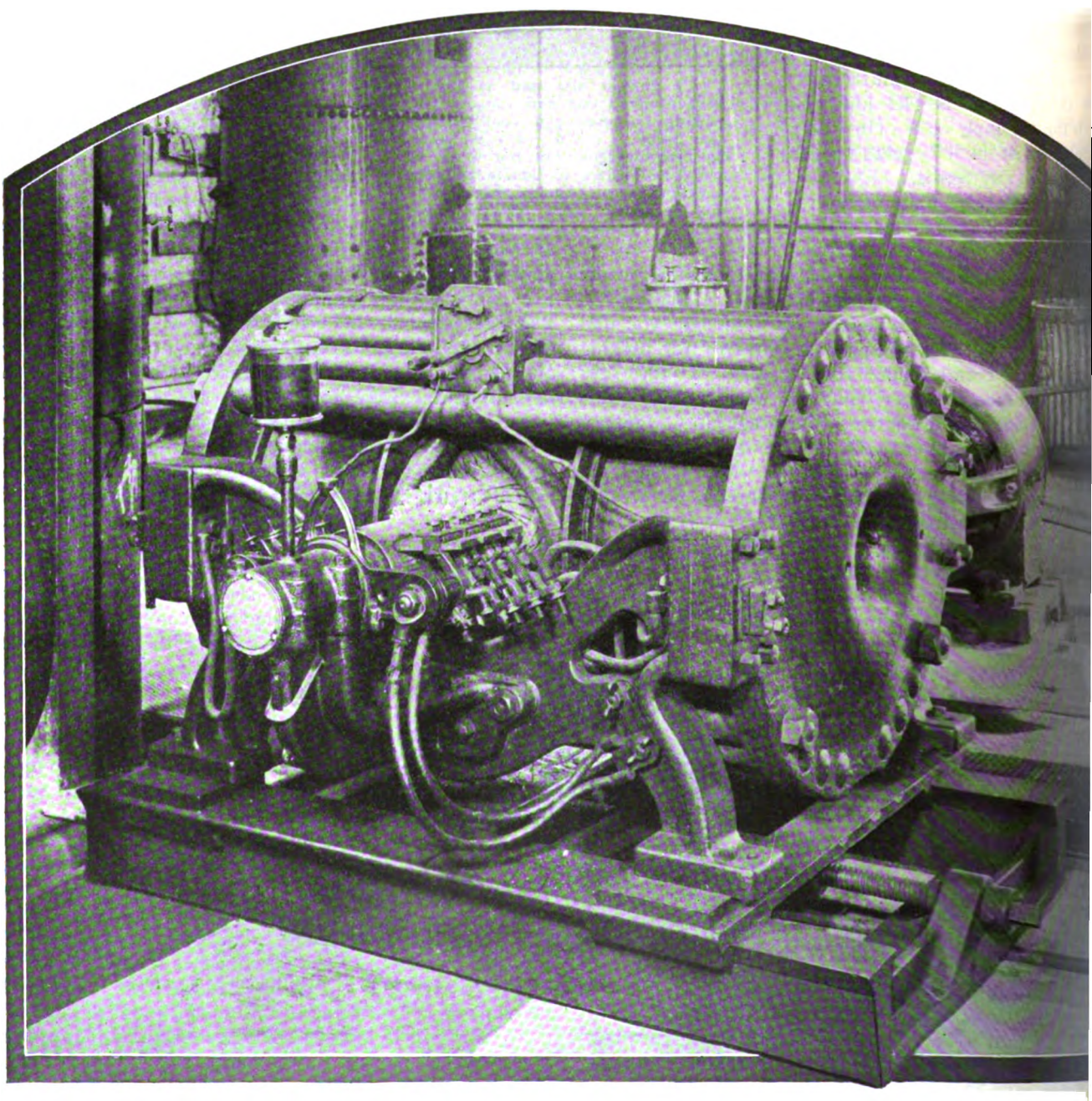
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facturers have always lived aloof from that before. That element of the cost of distribution wasn't part of their costs. That is a more potent drain on the profits than the cost of financing their distributor's stocks—but many of them don't realize it yet.

Hand-to-Mouth Buying is here to stay, make no mistake about that. It is profitable for the retailer. It isn't hurting the jobber, except perhaps the old line national jobber, and it won't hurt the manufacturer—provided all three of them exercise a little plain horse-sense. Orders may be small but there are lots of them, and they come in regularly instead of by fits and starts.

If anyone thinks that a decent profit can't be made while business is done this way let him look at the stock market. Prices generally have never been higher—extra earnings, as shown by cash and stock dividends, never larger. All that is needed is the willingness to face the new situation and work out the answer, which will probably be different for each business.

Retailers and jobbers who find present conditions not to their liking have usually failed to determine the particular point in their business beyond which the cost of placing and handling orders exceeds the cost of carrying an adequate stock. Let them do this, then abide by their findings and much of their difficulty will vanish.



Thompson-Houston Electric Company Incandescent Dynamo rated at 110 volts, 1150 r.p.m. which has been in use in the laboratory of George Washington University, Washington, D. C., for over 25 years. It was originally used by a power company in Washington for generating current for street lighting. The nameplate does not give the kilowatt or ampere rating, but it is known that it was used for 400 16-candle power street lamps. The nameplate shows that it was patented in 1879.

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Cutting Maintenance Costs by Improved Painting Methods

The Advantages and Developments of the Spray Gun and Its Uses

By E. I. Bell

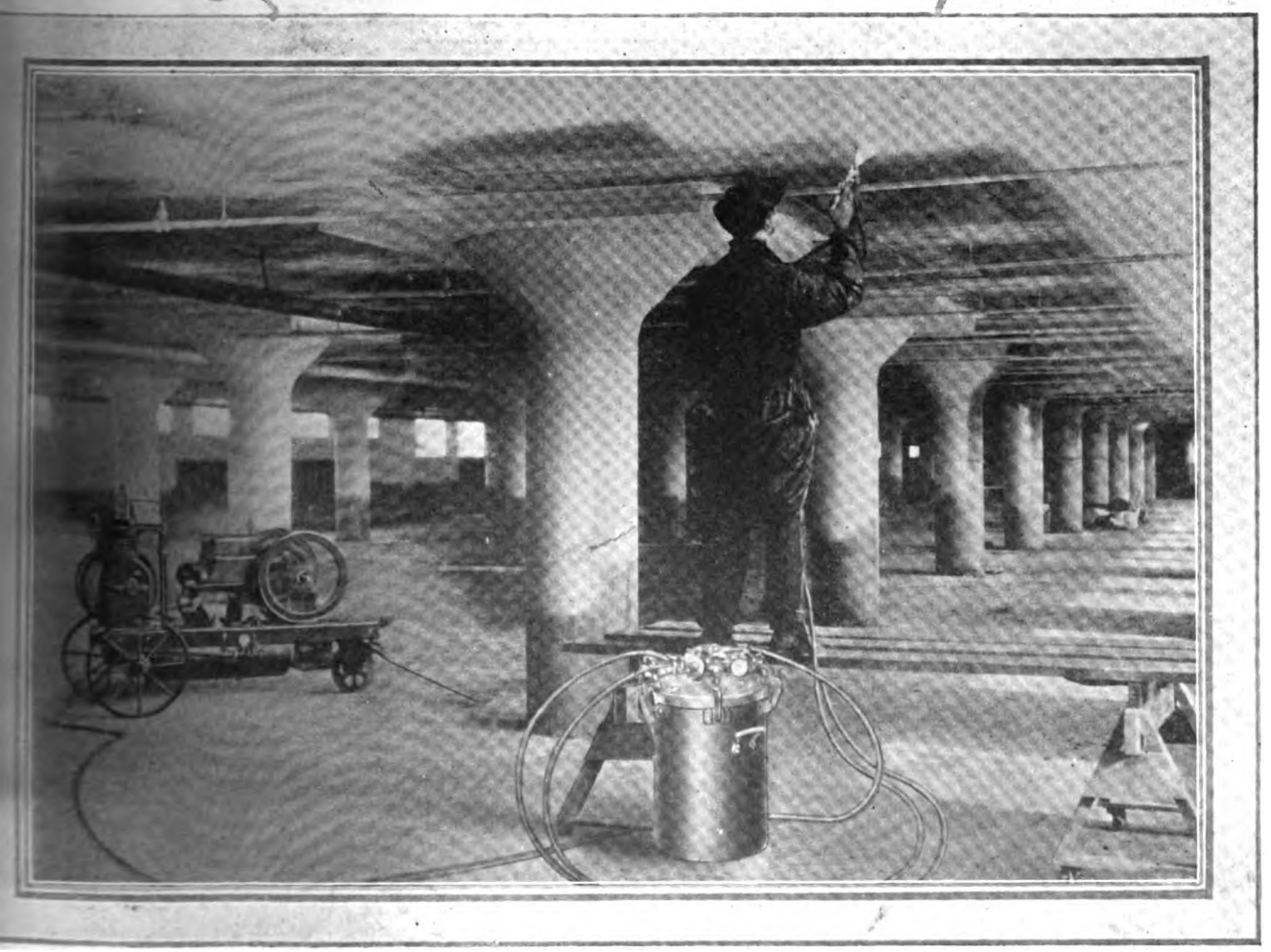


Fig. 1. Radiators were seldom well finished by the old brush method, but every inch is painted when a spray gun is on the job, and one operator easily does 15 times the work as he could do working under the old method.

THE rapid strides made by the spray gun method of painting has been fostered during the past few years by: (a) The lack of good brush painters, (b) The high wage rate of this class of labor, (c) A demand for speed in maintenance work, (d) Insistence of lower maintenance costs, (e) And, the development of spray-gun equipment which applies lead and oil paints, ready mixed house paints, mill whites, flat wall paints, varnishes, enamels, shingle stains, oxide paints, graphite and asphaltum paints, lacquers and similar finishing materials with considerable efficiency and economy.

Comparing hand labor costs with the spray gun cost of doing the same job is most interesting. In bridge painting, an operator covers three times the surface with a spray gun as he does by hand. In factory painting five times as much. In freight car painting, seven or eight times as much. In radiator painting, the difference is very great—probably fifteen times as much with the spray gun as by the old brush method.

Fig. 2. Factory painting—one coat will white paint spray—applied doing the job of two brushed coats—applied five times faster—painting around pipes done without any great retarding of speed.



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Fig. 3. Enameling of small metal parts—the spray system gives a much higher quality of work than could possibly be done by any other method.

The time saving ability of spray gu painting, although obvious, is seldom full appreciated until it is tried out in one' own plant. On straight-away surfaces or in places difficult to reach, the spra gun operator has a tremendous advantag over the brush man. But not only doe the spray gun save the maintenance ma its cost over and over again during a ye by permitting the reduction of the pain gang's personnel; it also shows remarkab economies in the quantities of paint use Of course, a new man or one of the irr concilable "old-timers" may claim th paint is wasted by this method. But a matter of fact the nozzle of the gun c be so adjusted that the loss is nil.

Then consider some of the other adva tages of this form of doing the factor machinery, or outside paint maintenan jobs. One of the most important thin for the painter to do is to work each c into the surface thoroughly. The spra gun does this and more. It actually dri the finely atomized particles into the po of the material being refinished. It d this in a smoother way than the ha



Fig. 4. Showing an automobile finishing shop installation—h mainly lacquer enamels are use turning out a high class of wor the quickest possible time.

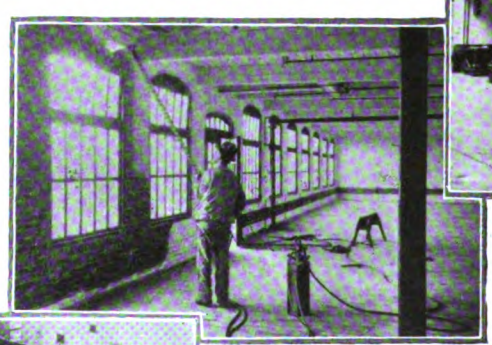




Fig. 5. The extension arm makes possible factory wall repainting without the use of a ladder. Note: There is no need of covering the windows when using modern spray gun equipment. The paint goes where it is wanted—no spattering or dripping.

Fig. 6. Painting freight cars from the ground. The extension gives the operator the same control as he would have with a brush, and his speed is multiplied at least seven times.

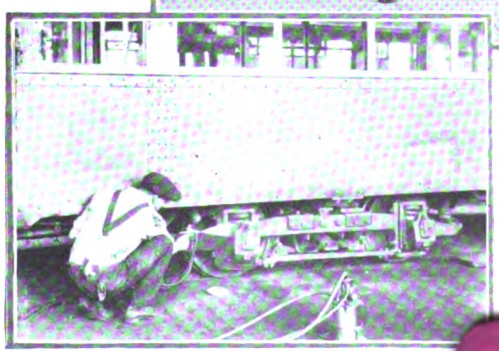


Fig. 7. Painting street cars now calls for lacquer as well as enamel materials—picture shows spraying of trucks, easily reaching ordinarily inaccessible places and doing in fifteen minutes a job that would require at least two hours of brushing.



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brush method need ever hope to approach. It leaves no "thin spots," no brush marks, no streaks in the paint film to wear down unevenly. It presents a uniform, firmly laid unbroken film which will wear down evenly, and thus save the surface longer and better than any other known method of applying paint. The speed of spray gun painting at no time interferes with the high quality of the work. There is no dripping, nor spattering, and every inch of surface is evenly and uniformly coated.

To save labor, time, and money on any paint job, regardless of the surface to be covered and the kind of paint to be used; to have the man power and time available to do two jobs where only one could be done before; to make every job a quality job, is to adopt this better method of painting.

Operators of fleets of buses, taxicabs, and high grade delivery trucks, which must keep them in first class condition both as regards looks and mechanical details have adopted the spray gun quite extensively and with good results.

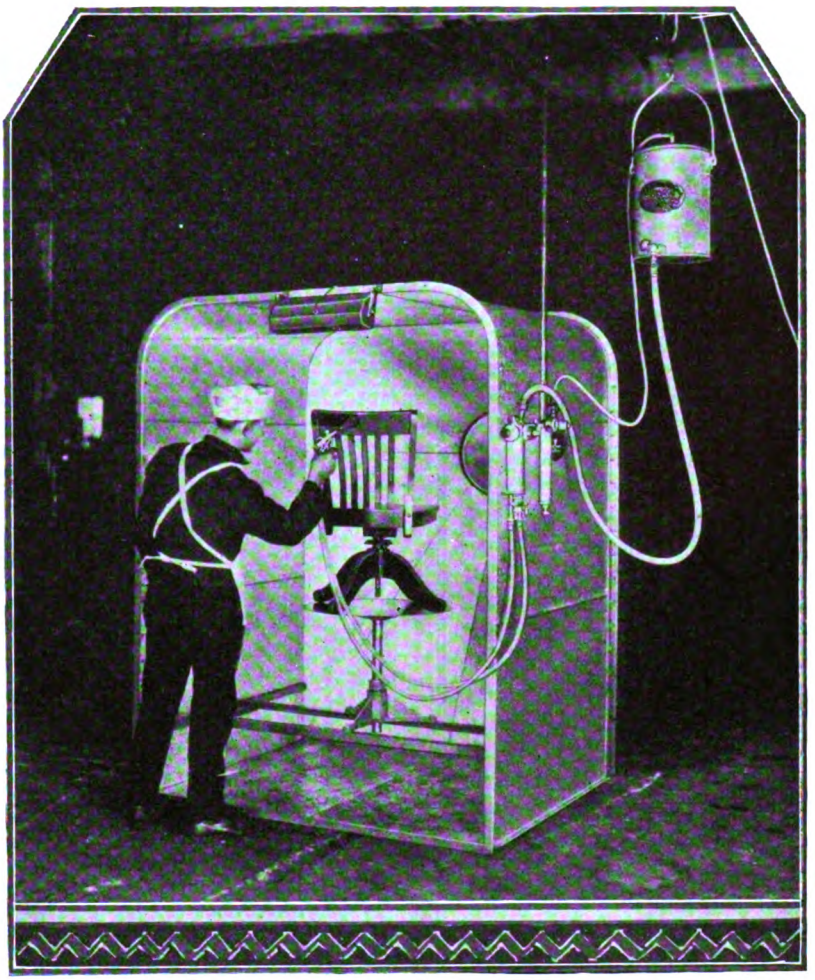


Fig. 8. A neat hook-up for handling furniture finishing jobs. Quick, clean and highly efficient.



Fig. 9. Remember the long tiresome task of painting bridge work. It is a simple job with the spray gun, and the time is cut one-third.

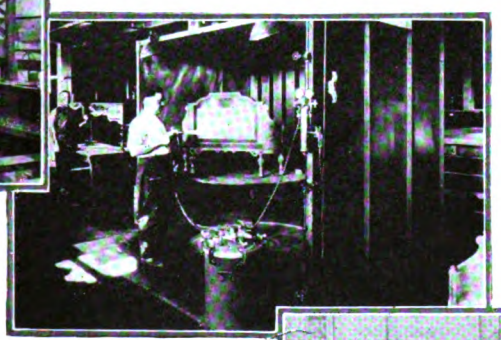


Fig. 10. The bed end is varnished with spray gun at rate of 30 an hour, while to brush would reduce that speed to 5 to 6 an hour—cleaner and better work is done, too.



Fig. 11. So easy is it to operate the spray gun that many small refinishing shops have added this equipment to their facilities. To do a good lacquer job the spray gun must be used.

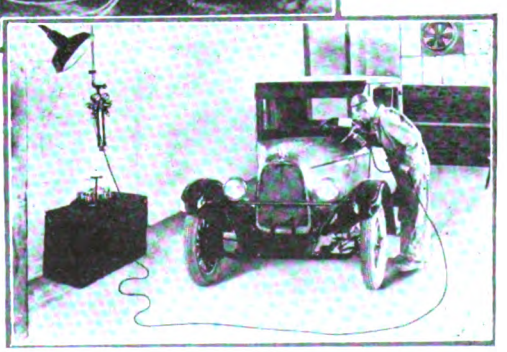


Fig. 12. A touch-up job on lacquer finish is here shown—a scratch is filled in and blended so that damaged spot cannot be detected—this gun is also used for decorative work.



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Handling Large Quantities of Automobile Tires

By F. C. Eibell

THE four accompanying illustrations show a rather ingenious installation of a form of materials handling equipment, used in place of an elevator, with which automobile tires may be lowered by one man from the storage room in the second floor of a building to the ground level. It consists essentially of a monorail, and electrically operated hoist and the carrying platform for the tires.

The control of the electric hoist, governing the lifting and lowering of the load, is illustrated in Fig. 1. The push button mechanism is mounted on the wall close to the operating chains of the double lift hoist which controls the movement of the hoist and load along the I-beam. This arrangement makes it possible for one man to move the loaded skids from the interior of the storage room to the desired point on the I-beam outside of the building and lower them to the traile waiting in the yard belo as shown in Fig. 4.

To avoid wiring the beam and the use of curre collectors, flexible cab were used for the main co ductors which operate t hoist and the contracto and a separate cable for t push button connectio These cables are suppor in loops by small rol hangers that operate alo a taut wire on the side the I-beam, opposite operating travel chain of trolley.

Movement of the ho along the I-beam is acco plished by means of a dou lift hoist with exten shaft and handwh mounted above the track a point suitable to mak convenient for the ma the push button station operate it. The load ch of this double lift hoist so arranged that they over idler sheaves below double lift hoist and at ei end of the beam.



Fig. 1. Ready to lower the load. The operator stands safely inside the building, the lifting and lowering being accomplished by simply pressing buttons. Movement of the load can be controlled accurately.



Fig. 2. The installation is such that only one man is needed to control the vertical and horizontal movement of the electric hoist and its load.

Fig. 3. Note the skid, the supporting members at the four corners are lengths of chain, with hooks on both ends, covered with rubber hose. This has proved to be a highly satisfactory arrangement.

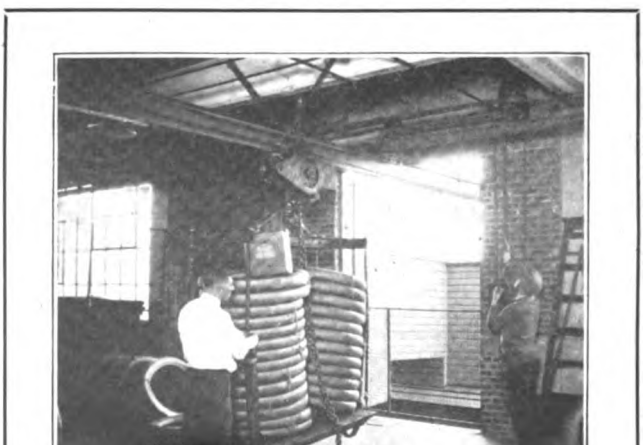




Fig. 4. To the waiting tr below, the loaded skid tires are lowered by the erator at the push bu station on the upper f

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Lowering Costs by Motion Study

An Explanation of Motion Study Methods and Results Obtained in One Plant

By L. A. Sylvester

A CLEAR distinction should be made between Time Study and Motion Study. Time Study has been defined by F. W. Taylor as "the art of finding how long it takes to do work." Frank B. Gilbreth, the leading motion study exponent defined motion study as "the science of finding the one best way to do work." Mr. Gilbreth during his lifetime developed means of studying work minutely and he was the inventor of several devices for measuring work very closely. Mr. Gilbreth's pre-eminence in this work was so great that his own technique has been accepted as almost synonomous with motion study methods.

Among the devices which Mr. Gilbreth contrived are the micromotion study technique which records work with a motion picture camera and simultaneously photographs a clock which can be read as fine as 1/4000 of a minute. Another valuable device he invented is the chronocyclegraph. A chronocyclegragh record is taken by attaching a small electric light to a worker's hand and an exposed photographic plate records as a continuous pathe a single cycle of motion. A further contribution of his is the seventeen Therbligs shown in Fig. 1.

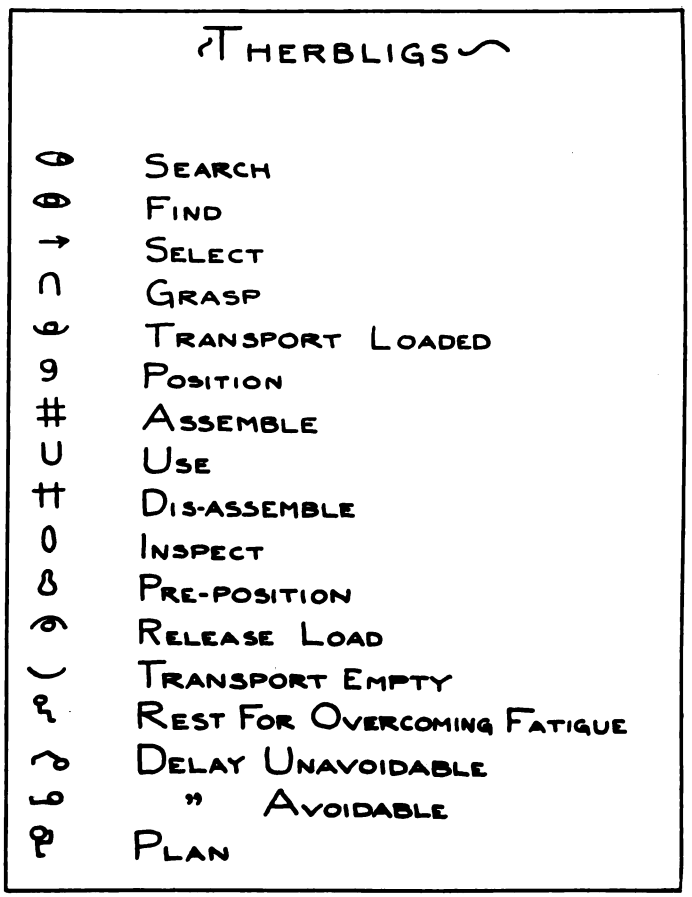


Fig. 1. The seventeen Therbligs devised by Frank B. Gilbreth for use in another study.

There is in the idea of motion study something very valuable and fundamental which can be applied in a plant to effect radical improvements in methods and equipment and to produce lower costs levels. The application of these fundamental ideas does not necessarily require an elaborate laboratory or the use of special photographic apparatus. It is the purpose of this article to outline a practical method of applying motion study, which is both simple and effective.

There are three tools which are essential and comprise the major part of motion study. These three tools are:

1. Layout diagram
2. Process chart
3. Motion analysis

While it may seem at first sight that these three records are detailed and elaborate, as a matter of fact they can be prepared with the greatest speed and facility. They present a detailed picture of just what comprises a given task and the speed with which every phase of an operation can be quickly visualized makes them extremely valuable.

There is no doubt that further improvement could be effected were motion picture or the chronocyclegraph used in addition, but they are not essential and the major part of the improvement or saving can be effected without them.

After an operation has been standardized by motion study it is the customary practice, even in the Gilbreth technique, to use an ordinary stop watch to arrive at a standard time for the operation.

To illustrate exactly how these three tools of motion study are used, it is best to give a brief description of a practical job. Fig. 2 shows a floor plan of a small building for washing sample oil bottles. The path followed by the bottles as they pass from operation to operation is shown. The purpose of the layout is to give a clear picture of the distance and the number of movements that the product makes as it passes through the process. A casual glance at the diagram is sufficient to inform one that the product is handled a good many times and that the incoming and outgoing bottles cross each other with more or less confusion. To remedy this situation, it is necessary to know exactly what operations are being performed and if possible simplify the entire operation or eliminate as many steps in it as possible. Fig. 3 shows a process chart and those operations which have been eliminated are indicated by a large cross mark. It should be particularly noted that the bottles were sorted and put

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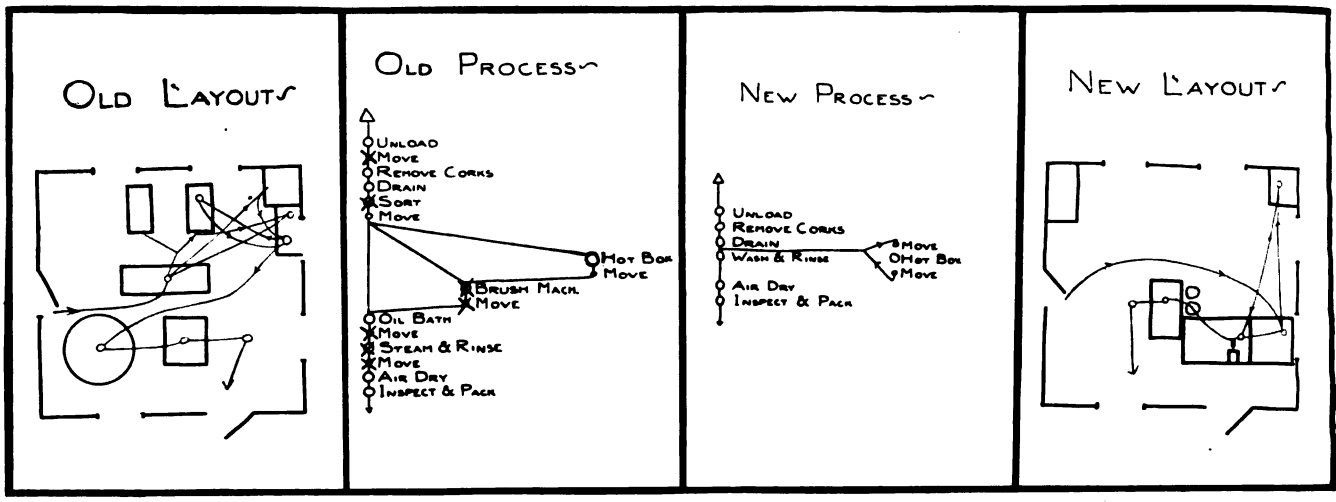


Fig. 2 to 5. An analysis of the work of washing bottles showing the old and new methods followed after a motion study of the process according to a system formulated by Frank B. Gilbreth.

through three distinct processes according to the difficulty of cleaning them. Fig. 4 shows the improved method and illustrates that a method was devised by which all bottles could be cleaned except those containing waxes and tars which are so heavy that they would not flow out of the bottle at ordinary temperature. A single additional step for such bottles is indicated, wherein they are put into a hot box and heated to a sufficient temperature so that the material will drain out. The simplification of the layout is well shown in Fig. 5.

The third tool in the motion study of bottle washing is shown in Fig. 6. It is a motion analysis. The separate motions of each hand are indicated in two columns and in the center column is indicated the direction in which the hands are moving. Where the arrows point together indicates that the hands are moving towards each other. Two vertical lines indicate that the hands are neither moving towards or away from each other but are engaged in some work without any change in their relative distance.

A careful study of this figure will reveal that the first motion of the left hand consists of Gilbreth's Therbligs "Search," "Find" and "Grasp." It would naturally arise in the mind of the careful analyst that the "Search" and "Find," could be eliminated. We considered it but did not deem it advisable.

The natural question arises as to just what benefits accrued from this motion study. In this case, as is quite usual with motion study, the advantages were manifold. One of the great features of motion study, the feature which makes it an indispensable tool in management technique, is the great stimulation and thought provoking influence that it has.

In the bottle washing plant production was increased from an average of 600 bottles daily to 1600 bottles daily.

Other benefits derived from this motion study in the bottle washing plant were:

1. A decrease in cost of 48 per cent and an increase in earnings to operators of 30 per cent.
2. A large increase in total output of the equipment.
3. A simplification of the method and equipment with its consequent saving in maintenance.
4. An operation which was definitely standardized and could be easily taught and learned.
5. A saving in material due to the using of a cheaper and more efficient washing solution.

Motion Analysis

	Left Hand		Dir.	Right Hand	
3	Place on Brush	#U	⇀↽	Wash Outside	U
4	Remove	#	⇀↽	Grasp	∩
5	Move to Next Bottle	∪	↔	Place in Rinse	∪∩
1	Sink & Fill	⊙⊙∩	‖	Remove from Rinse	∪∩∪∩
2	Raise to Brush	∪	⇀↽	Return to Brush	∪

Fig. 6. The third tool in the motion study of bottle washing is shown. It is a motion analysis of the movements of both hands of the operator.

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The Fundamental Principles of Good Crating

Proper Methods of Crate Construction and Packing

By Edward Dahill

Chief Engineer, Freight Container Bureau
American Railway Association

THE following information was prepared with the purpose of acquainting the shipping public and the employees of railroads with the fundamental principles of proper and economical crating as well as the manner of constructing and packing crates. While all of the essentials for proper crate construction are given, the application of them to the innumerable sizes and kinds of articles and commodities is not and cannot be illustrated and described constructively in these few pages.

It is known that a considerable part of the loss and damage being experienced in the shipment of crated articles can be attributed to the method of packing and to the kinds of containers used. For this reason, the Freight Container Bureau of the American Railway Association is only too glad to assist manufacturers in solving their crating and packing problems. The engineers of the Bureau are always ready and willing to give to the manufacturers and shippers the benefit of not only their technical training but also of their practical and varied experience gained in many parts of the country during the conduct of their surveys and studies.

It is desired to instruct and train railroad employees in the fundamentals of good crating so that they will be able to determine quickly whether an article is properly prepared and crated, and if not, wherein the preparation

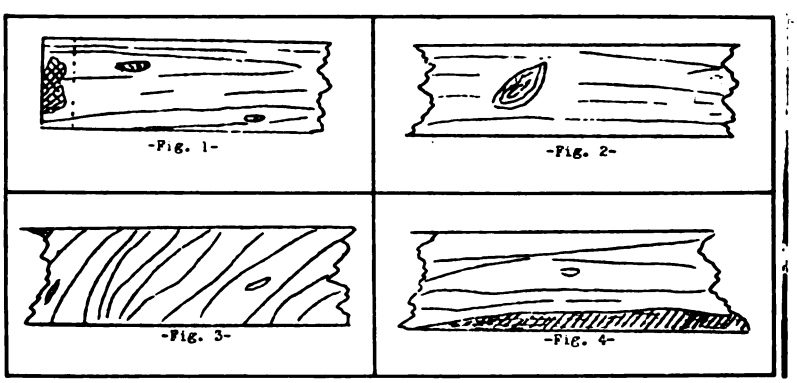


Fig. 1. The large knot or knot-hole would interfere with nailing—cut off board on dotted line.

Fig. 2. This large knot seriously weakens this board—cut off board at dotted line or else use board for blocking only.

Fig. 3. Bad cross grain—do not use for frame members or diagonal braces.

Fig. 4. A small amount of bark does not mean that this board should be rejected; but extreme care should be used in selecting this grade of material for frame members or diagonal braces.

Table A is provided for the purpose of determining the proper size of material to be used in the construction of crates. The size of lumber is determined by the gross weight of the article and crate.

TABLE A

Weight of Crate and Contents.	Minimum Dimensions of Lumber Used For Struts, Frame Members, and Single Diagonal Braces.
Up to 100 lbs.	3/4 x 2-1/4"
101 to 250 lbs.	7/8" x 2-7/8"
251 to 400 lbs.	7/8" x 3-7/8"
401 to 600 lbs.	(7/8" x 4-7/8" (1" x 3-7/8"
601 to 800 lbs.	(1" x 4-7/8" (1-3/16" x 3-7/8"

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TABLE B.

Width of Piece	Minimum Number of Nails Each End of Piece
Up to 3"	2
3" to 5"	3
Over 5"	4

Table B gives the number of nails required for the different widths of lumber commonly used in the construction of crates.

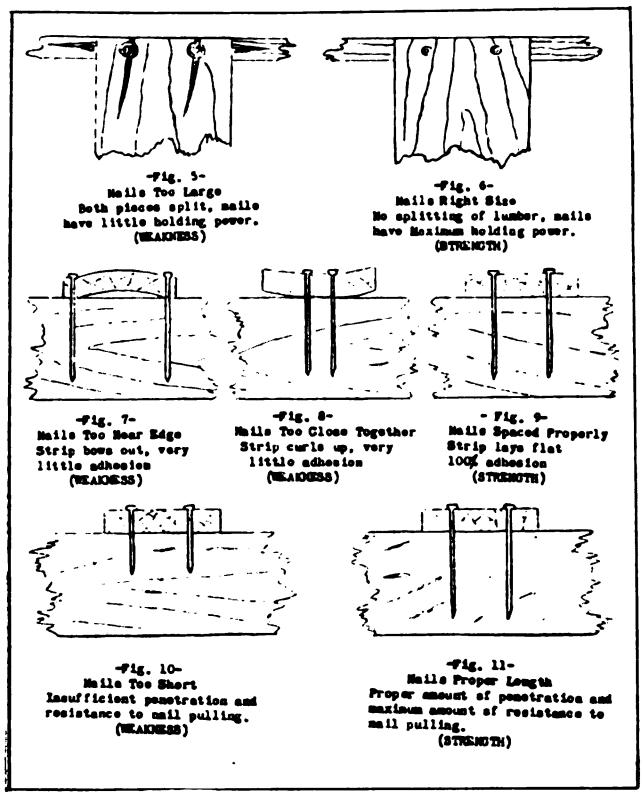


Fig. 5, 6, 7, 8, 9, 10 and 11. The right size of nail and the right number of nails directly spaced means efficiency, economy and strength in good crate construction. How this should be done is shown in the illustrations above.

and crating are poor, improper and inefficient. Further, the intent is to help them make out clear and understandable exception reports, and above all else, if their duties require that they take up such reports directly with the shippers, that they should be able to give positive and constructive help and assistance.

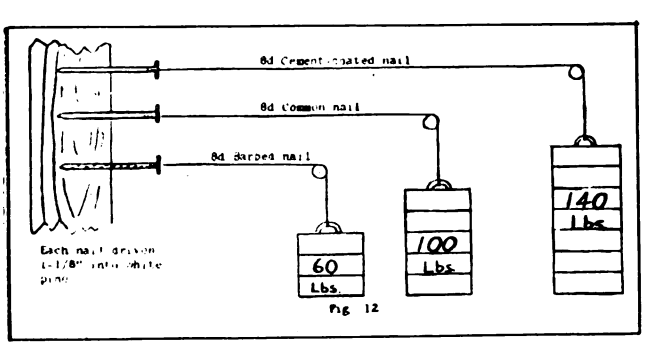


Fig. 12. Illustrates the effectiveness of cement coated nails and at the same time shows **the comparative** am force required to **pull out each** of rent **kinds of nails commonl** onstruction.

I have endeavored to make this discussion brief and t the point, concise and in non-technical language, usin sketches to illustrate in a practical way why certain prin ciples must be followed in constructing economical an serviceable crates. In the first place, all lumber used i constructing crates should be well seasoned; reasonabl sound; free from bad cross grain; free from knots o knot-holes which will interfere with the nailing, or knot or knot holes occupying more than one-third of th width of a piece of lumber in which they occur.

As a guide for determining the proper size of materi to be used in the construction of crates, Table A is ap pended. In this table the size of lumber is determine by the gross weight of the article and crate.

The number of nails required to hold any piece lumber in position used in the construction of crates is very important factor and should be given careful co sideration. The correct number of nails to be used any one piece of material is usually determined by t

TABLE C

Thickness of Boards Nailed Through	Thickness of Boards Nailed Into (Soft Woods) Size of Nails in Pennies				
	1/2"	5/8"	3/4"	7/8"	1"
1/4"	4	4	4	4	4
3/8"	5	5	5	5	5
1/2"	6	6	6	6	6
5/8"	..	7	7	7	7
3/4"	..	..	8	8	8
7/8"	..	..	..	9	9
1 "	..	..	..	..	10

Table C gives the proper size of nails to be used for different thicknesses of lumber.

width of the piece of lumber through which the n are to be driven. Table B gives the number of n required for the different widths of lumber commo used in the construction of crates.

Another factor to be taken into consideration is size of the nails to be used. This is largely depend on the size of the material which also determines spacing of the nails. The following simple rule, if lowed, will guarantee that the nails are spaced effectively.

When two or more nails are required (see Table B) con the board composed of two or more equal widths and dri nail through the middle of each of these widths.

When possible cement coated nails should be use crate construction. Cement coating on these nails o additional resistance to nail pulling and as a result are much more efficient than the common nails. The

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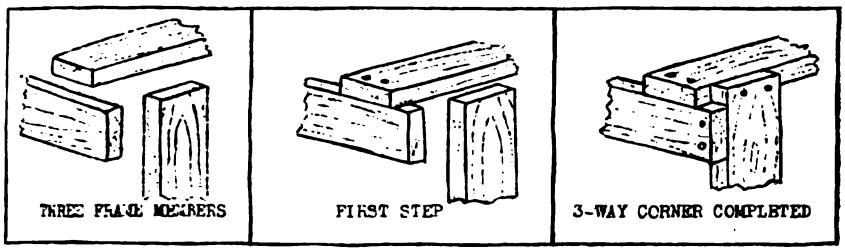


Fig. 13-

Fig. 13. The best, strongest and most rigid corner construction for crates is the three-way corner. The proper method of constructing three-way corners is shown herewith.

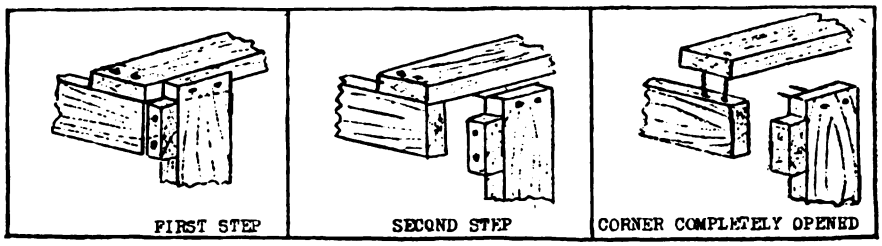


Figure 14

Fig. 14. Because of the method of construction of three-way corners some difficulty is often experienced in opening them. The illustration above shows how this should be done.

nail is less effective in crate construction than the common nail. This is due to the fact that the barbs on these nails break the fibres of the wood as they are driven in. Since it is the fibres of the wood which hold the nails in place and at the same time resist nail pulling it is evident that any nail which does not tend to destroy the fibrous structure of the material is more efficient than one that would. Cement coated nails as a general rule cost more per pound than either the common or barb nail. But it will be found, however, that cement coated nails are cheaper per nail than either the common or barb nail. This is due to the fact that for the same penny size the cement coated nail is one-eighth of an inch shorter and is made of wire of smaller diameter than is used either in the common or barb nail. As a result, the cement coated nail is lighter in weight and more of them are obtained per pound.

Table C gives the proper size of nails to be used with different thicknesses of lumber in building crates. When a medium hard wood is used nails one penny smaller than those specified may be used. When a very hard wood is used nails two pennies smaller than those specified will be used. Since a nailing table similar to the foregoing is not always available it will be an advantage to remember the following simple rule, which is given to assist in the determining the proper size of nail to use.

For soft woods (similar to spruce or white pine) the nail required will be determined by the thickness of the board holding the head of the nail. The size of the nail will be equal in pennies to eight times the thickness of this board, measured to the nearest eighth of an inch, plus two.

Nails one penny smaller may be used for medium hard woods (similar to southern yellow pine or gum).

Nails two pennies smaller may be used for extremely hard woods (similar to birch or oak).

The formula for determining the proper size of nail to employ may be more readily understood from the following example: if ¾-in. spruce were used the size of nail required would be equal to 8 times 6/8 plus 2 or 8 pennies. This rule automatically provides for smaller nails when sheathing members are fastened to frame members.

Nails should never be driven into the end grain of lumber, as they have only 50 per cent. of the holding power which they normally would have were they driven into the side grain of the material.

The best, strongest, and most rigid corner construction of crates is the three-way corner and in the construction

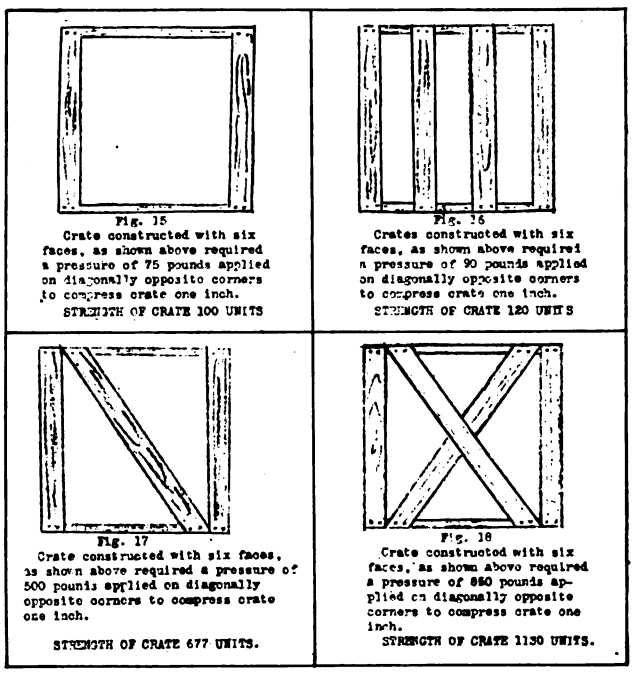


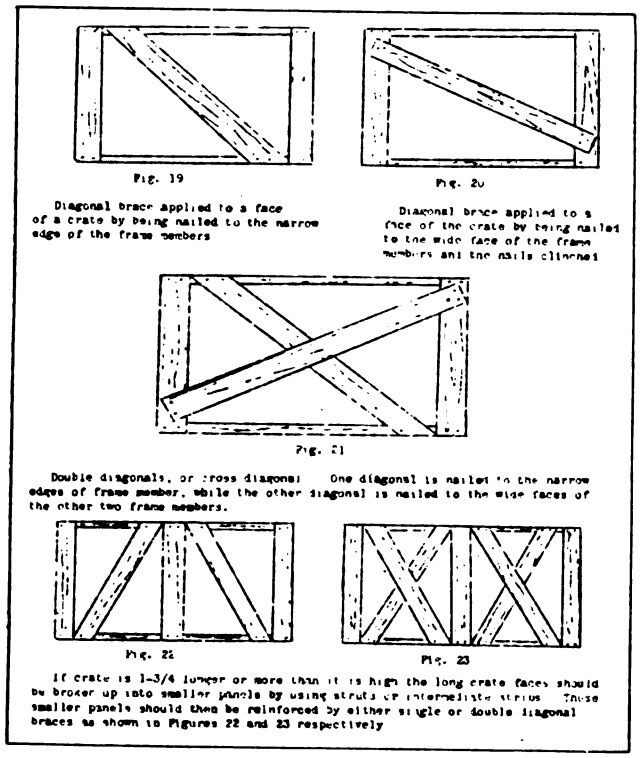
Fig. 15, 16, 17, and 18. Four methods of constructing the frames of crates are shown in this illustration. The legend under each figure tells the story and shows the advantage of using diagonal bracing.

of such corners all nails should be driven into the side grain of the material. By following this practice, that is, the use of the three-way corner, if one member of the corner starts to work loose one of the two additional sets of nails will counteract this tendency. All the members of the corner should be of the same thickness but the pieces may be of different widths without weakening the corner construction.

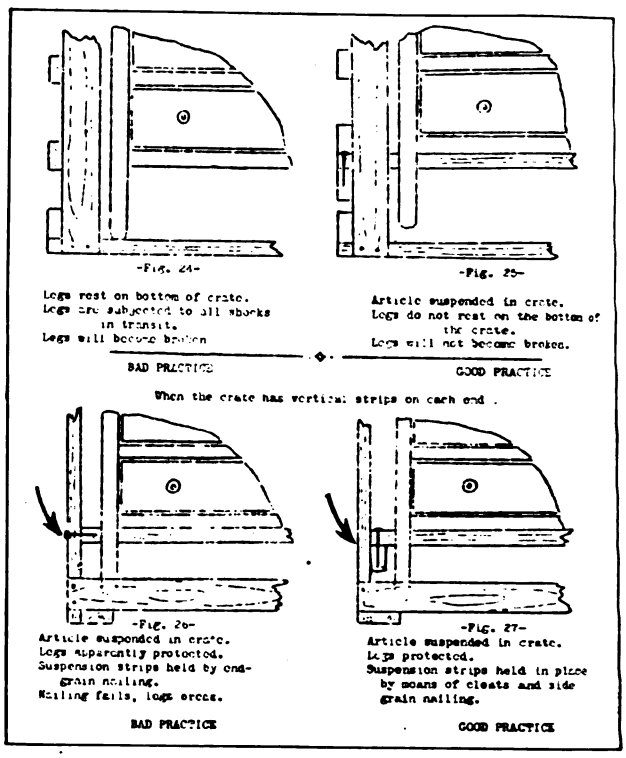
There are sixteen ways of making a three-way corner; get the habit of making your three-way corner like that shown in Fig. 13 and do not let the other fifteen ways confuse you.

It is often contended that a three-way corner is difficult to open. This contention in itself is the best proof in the world that three-way corners should be used by shippers to thoroughly protect their goods. Merchandise may be damaged in opening three-way corners if crates are smashed apart. Which is more important, the se-

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Figs. 19, 20, 21, 22 and 23. A few practical ways of applying diagonal bracing in crate construction. The legend under each figure explains the advantage of each method.



Figs. 24, 25, 26 and 27. This illustration shows the proper method of suspending furniture in crates and the legend under each of the figures is self-explanatory.

curity of the merchandise or the disinclination of the consignees' employees to use a little patience and common sense in opening crates? In order to prevent damage to the contents of crates when opening them it might be suggested that the best practice is to saw through one piece just in back of a set of nails, or else use a nail puller and pull out one set of nails. In this way the seal of the three-way corner is easily broken.

Some of the accompanying illustrations show four methods of constructing the frame of a crate and the legend under each figure tells the story and shows the advantage of using diagonal bracing. In considering diagonal bracing as well as crate construction it might be well to determine whether the contents of the crate holds

TABLE D

Length of Span in Feet	Required Minimum Thickness in Inches
0 to 2	1/4
2 to 3	3/8
3 to 4	1/2
4 to 5	5/8
5 to 6	3/4
6 to 8	7/8

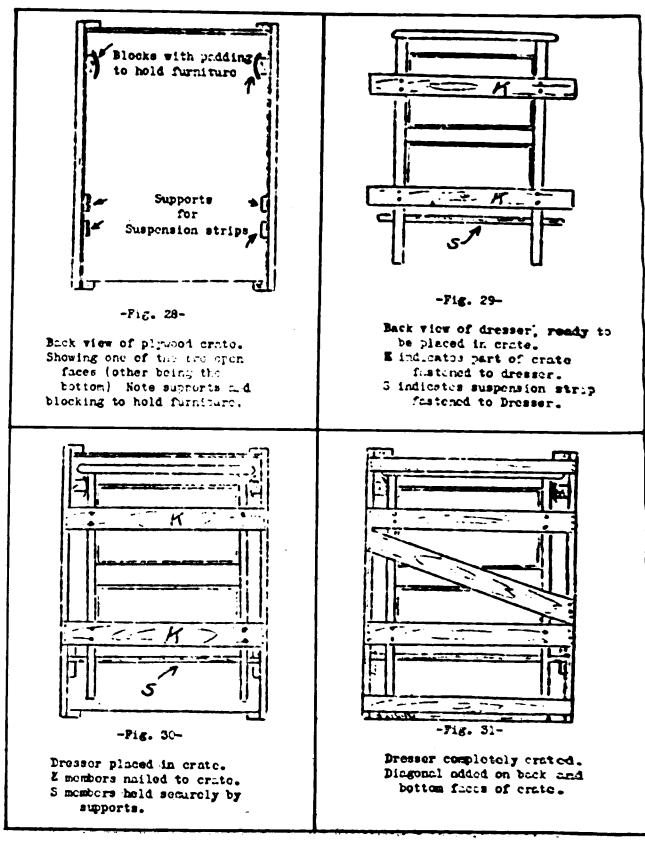
PREPARATION OF THE ARTICLE

Table B gives the thickness of lumber to be used for sheathing.

up and supports the crate or whether the crate actually supports the contents. A crate skewed one inch out of shape usually allows the weight or pressure of other articles outside the crate to press against the contents. Hence, it is clearly evident that a crate should not be used if it does not protect the contents from rubbing, marring, gouging or blows which may break or damage the whole or part of the contents

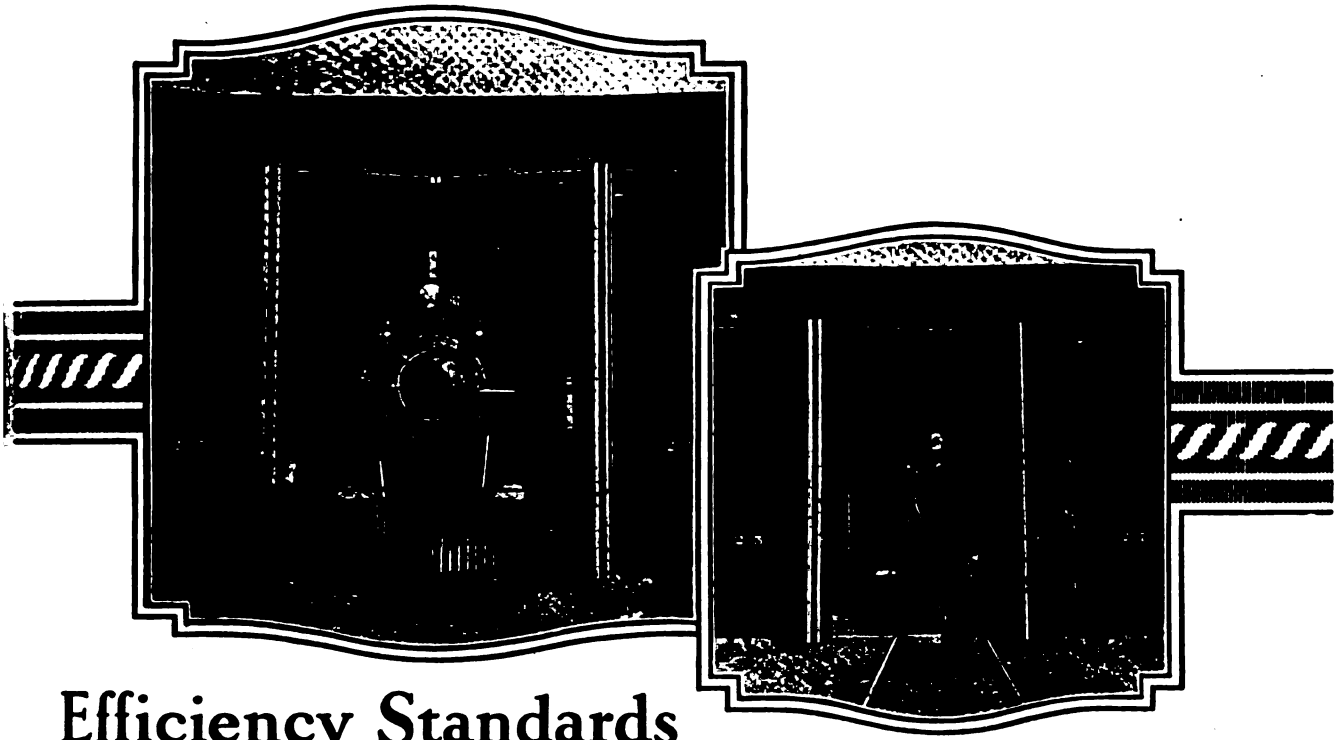
The first procedure in good crate construction is t build a strong, rigid frame and to then cover it wit

(*Continued on page* 36)



Figs. 28, 29, 30 and 31. Another group of illustrations showing good practice in packing furniture in wood crates. The legend under each figure explains the operation in each case.

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Efficiency Standards *demand* Industrial Slidetite!

The statement of the Rock Island Lines quoted below is typical of the experience of thousands of industries where R-W Doorway Equipment is giving constant service.

The Engineer of Buildings of the Rock Island Lines, Chicago, says:

"Doors on railroad buildings must stand severe weather conditions and unusually hard service. Yet they must operate smoothly, open completely to clear moving locomotives or cars, and not sag or stick. Minutes count in railroad operation; and a few minutes lost by a stuck roundhouse door are not easy to make up.

"When we recently doubled the capacity of our Burr Oak roundhouse, Richards-Wilcox hangers and ball bearing trolleys were installed on the 20 new door openings. This roundhouse has 40 stalls for freight and suburban passenger locomotives; and as the locomotives are constantly coming and going the 13x17 ft., 4-fold doors are opened and closed many times during the 24-hour day. Although the doors weigh about 1700 lbs. apiece, they are easily operated by one man.

"R-W equipment was specified for this roundhouse because of the performance of R-W equipment in roundhouses, storehouses, and shops throughout the Rock Island system. The first R-W *Slidetite* equipment was installed on the doors of our Chicago coach shops in 1919, and it and some 200 other sets are still in daily use.

"Eight years' experience has proved that R-W equipped doors operate smoothly and easily, stay where they are put, do not sag or stick, and seldom get out of order. The ordinary double door has too much weight on the hinges and no support from above, so that it quickly sags and warps.

"The first R-W equipment installed by us is still in use, and repairs and maintenance have been very light."

There's not an industrial doorway problem, large or small, that R-W Doorway Equipment will not solve. R-W Doorway Engineers will help solve your problems.

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Practical Suggestions for Joining Power Transmission Belts

By William Staniar

Belting and Transmission Engineer, E. I. du Pont de Nemours & Company

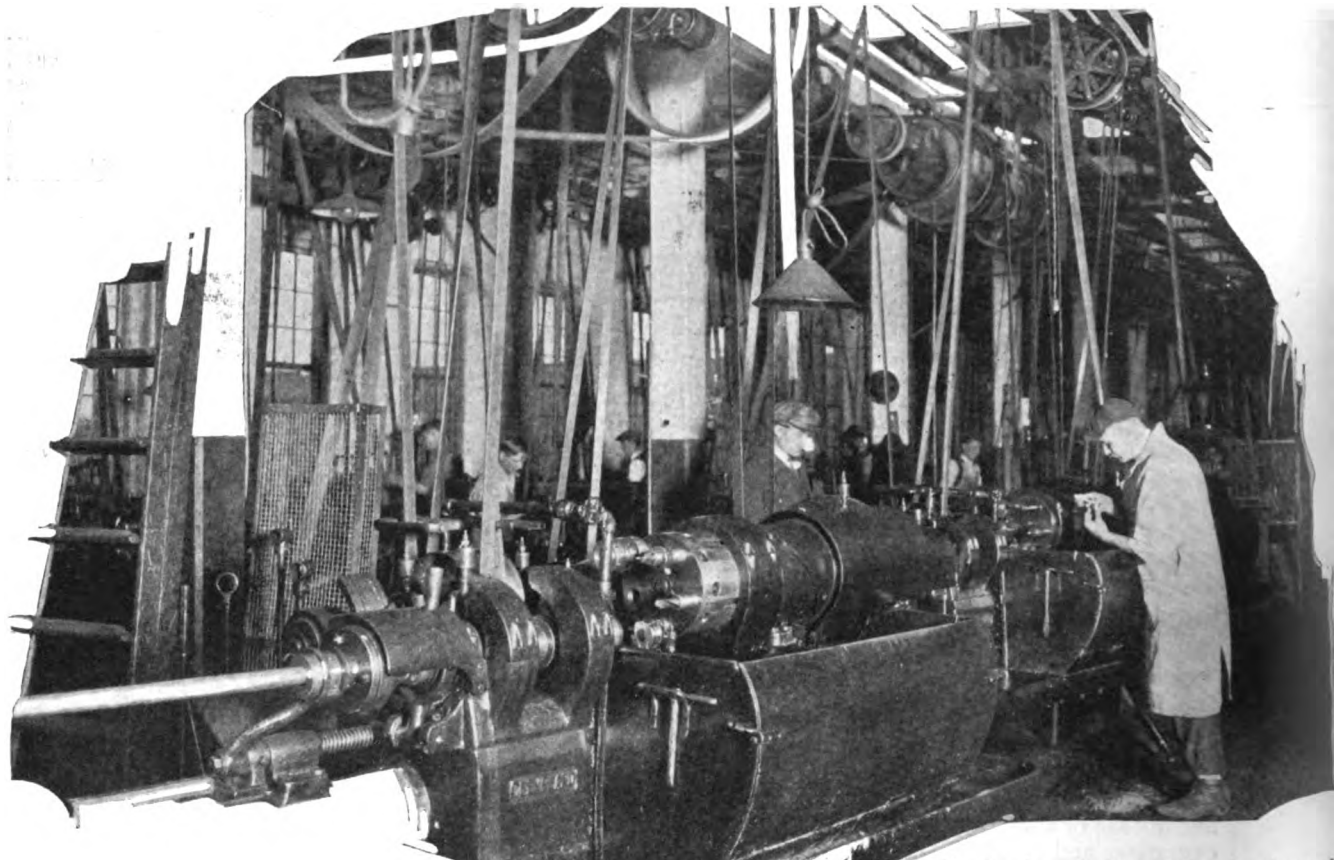


Fig. 1. A typical example of a group of belt-driven machines.

BELTING as a means of transmitting power has been in use commercially for nearly a century and in studying the progress that has been made in the perfection of methods for joining this power transmission medium it is interesting to notice that there is a manner of joining and a direct type of fastener for almost every problem that presents itself into the mechanical transmission field. No doubt the first commercial belt joint was made by punching holes in each end of the belting material employed and lacing or tying ends together by running narrow strips of some sort of material back and forth through these holes. To a certain extent this method has been perfected by the passage of time and is now known as the rawhide lace joint. It is somewhat primitive, however, and time has not eradicated its faults. When holes are punched near its end a belt is prematurely weakened and in addition to this a lace leather joint is thick and causes a thumping on the pulley which in itself results in loss of power.

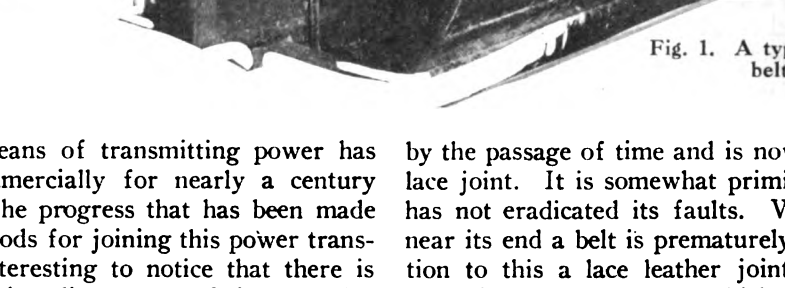


Fig. 2. Three typical examples of the modern method of applying rawhide and wire belt lacing. "A" shows the pulley side of a belt; "B" is the outside of a rawhide joint and illustration of the methods employed It is laced with soft wire.

The introduction o the wire lacing systen is a slight improve ment over the rawhid or lace leather metho because it resulted i a smoother join However, this was n entirely satisfactory i its early stages b cause the wire the obtainable could n resist for any leng of time the wear a tear, and it was sti

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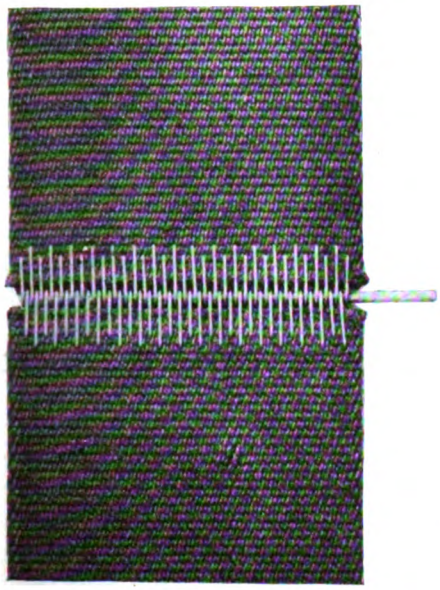


Fig. 3. An example of the wire hook method as applied to fabric belting with the rawhide pin shown projecting from one side.

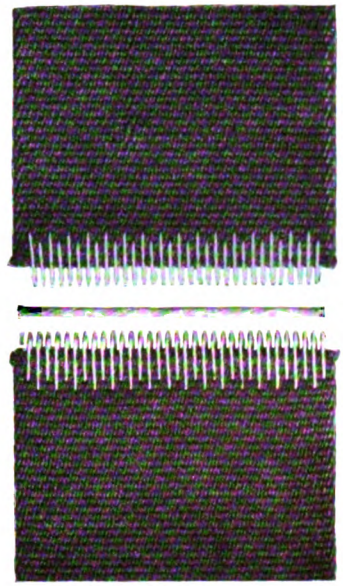


Fig. 4. The ease with which the joint shown in Fig. 3 can be made is clearly evidenced from the dis-assembled members shown here.

necessary to punch holes in the ends of the belts as was the case with the improvement of the rawhide joint. This method has also been perfected by the passing of time and today a special steel wire is laced through the ends of a pulley by a portable machine which results in an efficient joint where it is applicable.

Considerable time was required in the early stages of joining with rawhide or wire, with the result that man's inventive mind sought time-saving methods for this work. This led to the use of staples, hooks and rivets, which, in reality, was the beginning of the modern metallic belt fastener. However, the early metallic methods resulted in a hard and stiff joint, thereby causing the belt to crack and break close to the fastener. These methods were employed for a number of years with little or no improvement until the hinge or pin-joint fastener made its appearance. The hinge-joint was crude at first and caused considerable trouble because of early fatigue and crystallization of the metal used, due to the pounding action on the pulleys, but it was the beginning of the wire hook and pressed steel hinge-joints, which today are extensively used. These are the most efficient and quickly applied methods of belt joining employed in the manufacturing industries.

Today the hinge-joint is not applicable to belting much over 8 inches in width and of more than double leather or 6-ply fabric in thickness. In the course of

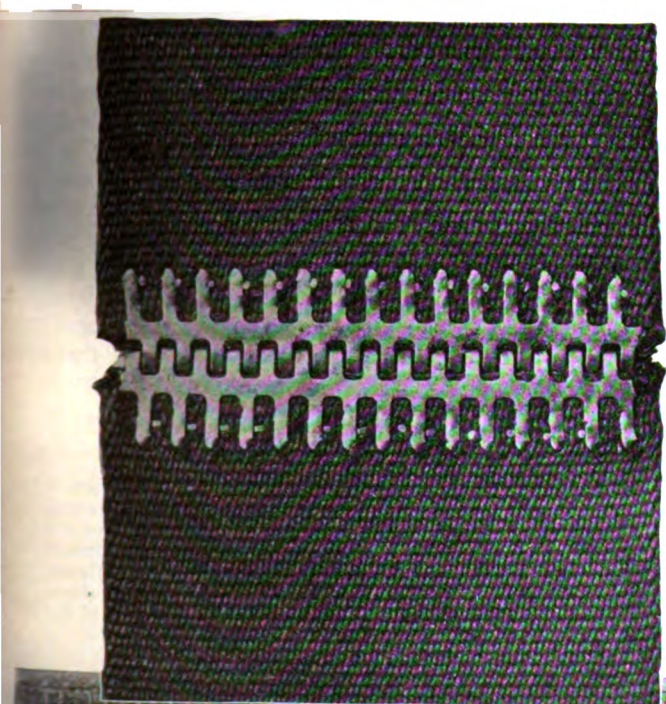


Fig. 5. A type of hinged joint of the pressed steel variety which has proven to be most efficient for its hinge employs two steel pins designed in such a manner as to give a rolling action on each other as the joint flexes on the pulley.

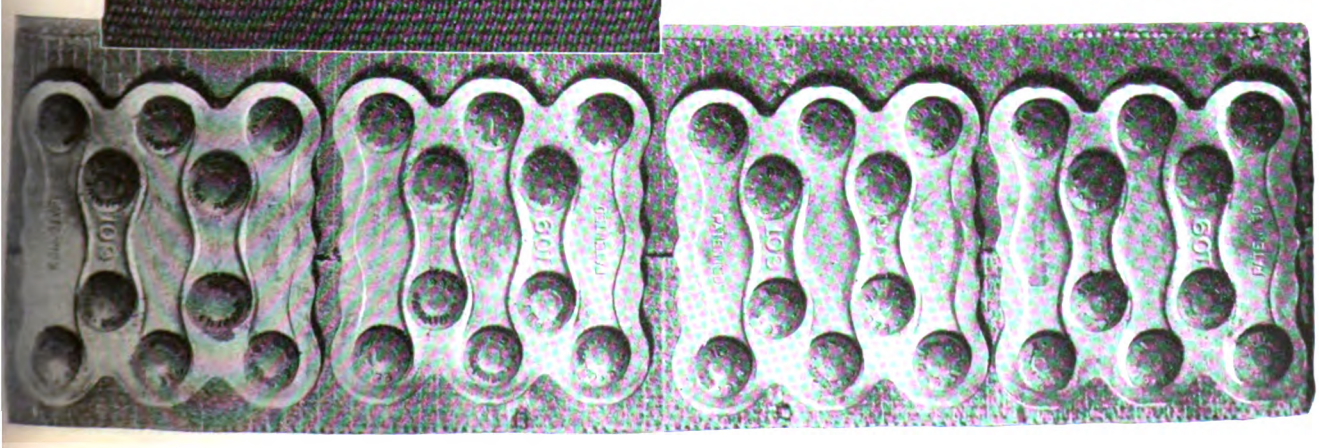


Fig. 6. A modern plate method of joining power transmission belting. It is likewise an efficient joint and is easy of application.

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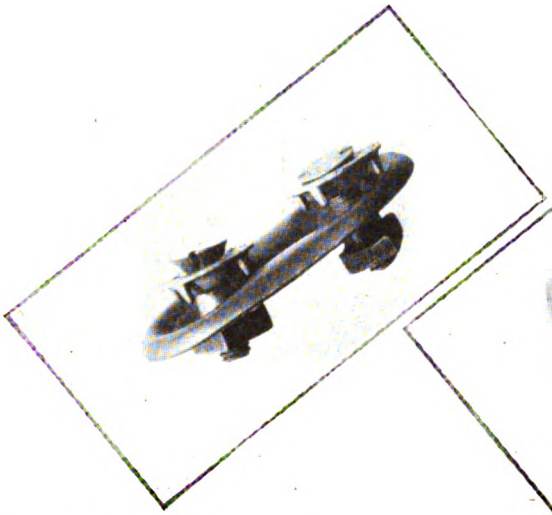


Fig. 7. For large high powered transmission belting the type of plate as shown is very suitable.

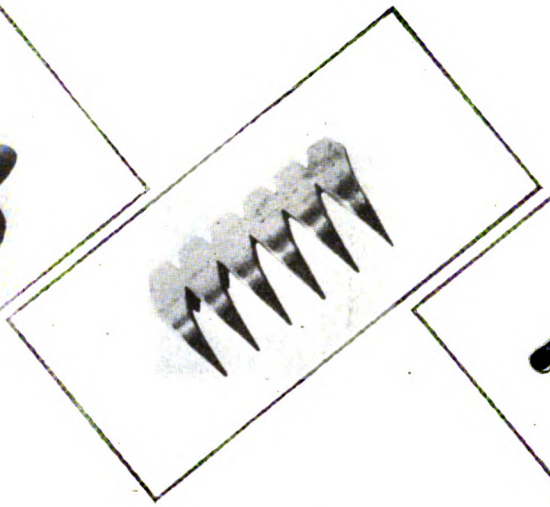


Fig. 8. Illustrates the now commonly used hand applied plate of staple type. It gives a strong and efficient joint and may be applied quickly in emergency.

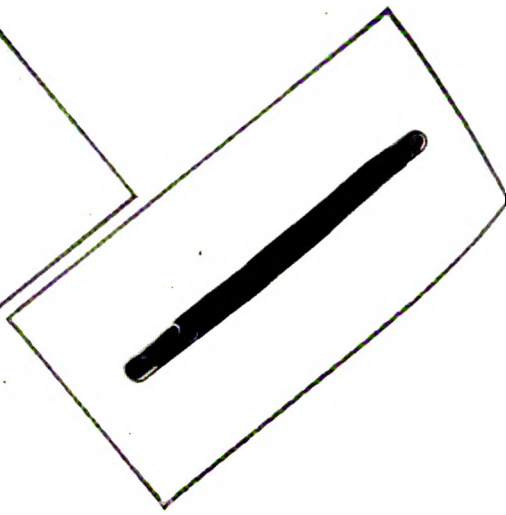


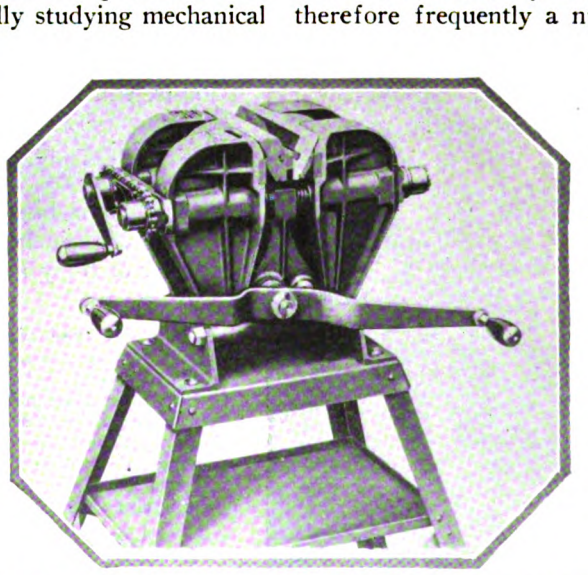
Fig. 9. An example of a belt joi made by a modern device showi that the hooks have been forced i the belt flush with the surface.

time and of necessity the metallic belt joining plate was evolved, with the result that now industry has the choice of a number of efficient plate fasteners for large power transmission and conveying belting.

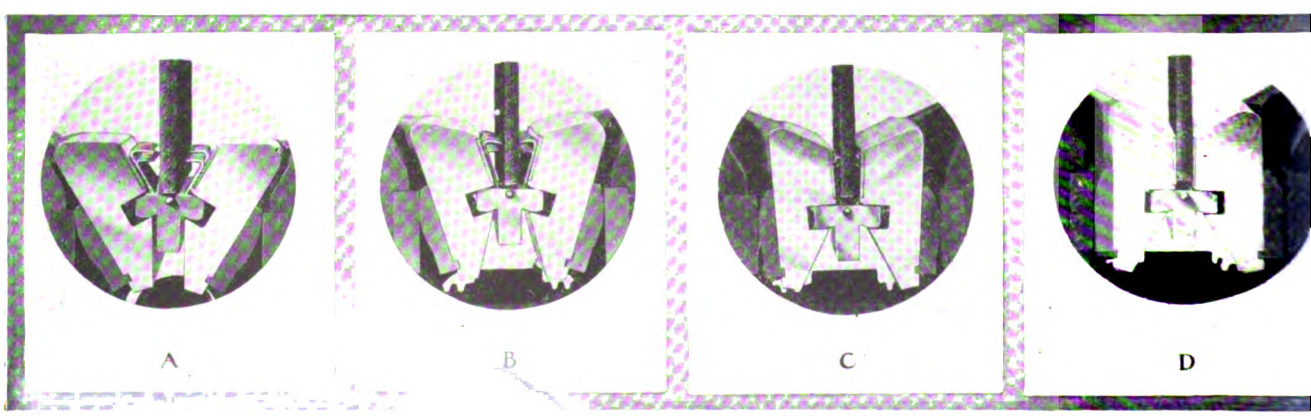
There is a type of belting for every mechanical and atmospheric driving condition and of necessity the art of power belt joining has kept pace with the perfecting of belting. The manufacture of belt fastening appliances has become a business in itself and at the present time numerous concerns are engaged in the production of these devices. They are continually studying mechanical transmission requirements and therefore are in a position to offer to the trade the very best and latest appliances for belt joining. However, regardless of the fact that there is a proper method of joining for every driving condition and a correct size of hook or plate for every size of belt, pulley, load and speed, the fastening problem continues to be a menace to production and the cause of at least forty per cent. of power belting breakdowns and production machine tie-ups.

Belt trouble in a plant is not ordinarily the fault of the belt; likewise, the avera joint trouble is not the fault of the fastener. The fa lies in poor selection, in both cases, because these fun mentals of plant operation are generally overlooked. his detail study of approximately 90,000 belting inst lations the writer has given particular attention to fastening difficulties and has discovered that almost wi out exception the selection of the belt joint is not ba on mechanical or operating conditions. On the contra it is left to arbitrary selection by the operating forc therefore frequently a number 6 hook or a large pl capable of holding a he double belt at high tension large pulleys, will be emplo on a narrow single ply operating over small pulley high speeds. There is only result from a misapplica such as this and that is early break of the belt at

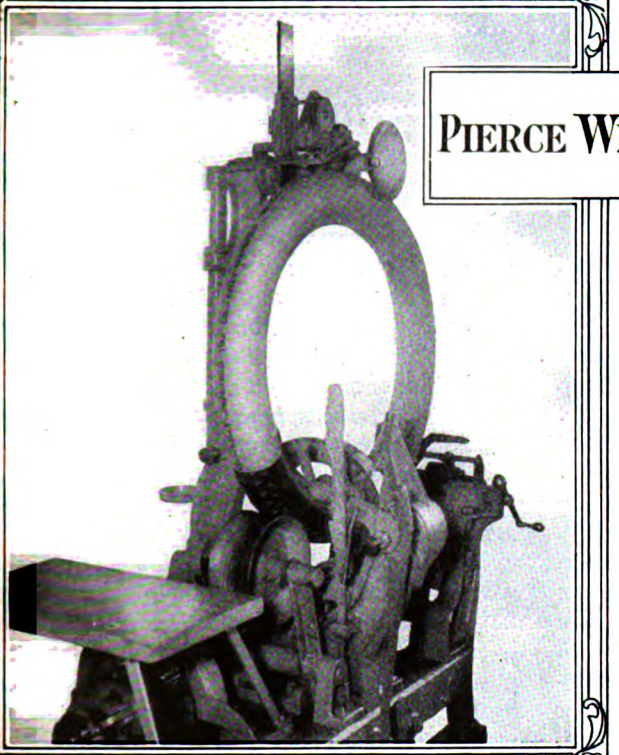
(*Continued on page* 40)



Figs. 10 & 11. The view at the left shows a modern type of belt lacing equipment and below are four additional views showing the different stages in applying a staple type lacing to the end of the belt.



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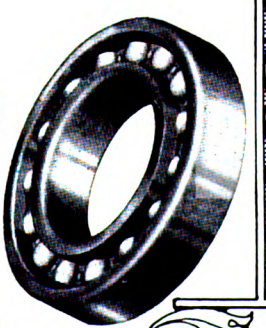
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The Single Jet Condenser

Its Construction and Application in Industry

By S. C. Martin

STEAM condensers have a wide range of application in industry, their use for producing a partial vacuum with consequent reduction of back pressure in the exhaust line from steam turbines and reciprocating steam engines being familiar to all power plant engineers. Condensers may be divided into two main classes, the surface condenser and the jet type of condenser, both of which have their own special fields of application.

Surface condensers have their chief use in connection with large turbines and steam engines, especially where it is necessary to use the condensate as boiler feedwater. A much broader field, however, is covered by the jet condensers in which one or more jets of water are utilized for producing condensation of the exhaust steam and for removing the condensate, together with the entrained air, by means of the momentum of the water jet discharging against atmospheric pressure. The ejector, or inductor type condenser employs a single jet of water flowing through a combining tube, having inclined ports for admission of air and steam. It is a very simple and compact device, and is suitable for almost all small steam power installations and industrial processes where a vacuum must be maintained, and where conditions do not make the use of a surface condenser a necessity.

The single jet condenser is of low first cost and maintenance. It requires no water or air removal pump and will maintain a high vacuum, the only auxiliary power apparatus being a circulating pump. Even this may be dispensed with if there is available a sufficient supply of injection water at a suitable head, as for instanc from a service main or from an overhead tank o elevated cooling system. The pressure required at th injection water inlet in the injector is 8½ lbs. or head of 20 feet. If the condenser can be equipped wit a tail pipe 35 feet in length it becomes in effect barometric condenser, and the injection water pressu can be reduced to almost zero.

Vacuum breakers are not generally used with th type of condenser, but instead a swing check valve installed in the steam line, and if the condenser is us with a steam turbine or engine an atmospheric reli valve is also required which operates automatically wh the condenser goes out of service and allows the stea to exhaust to the atmosphere. A strainer is desirab in the water injection line if the water supply is su that there is liability of sticks, grass, pebbles, etc. getti into the condenser.

No general foundation or structural supports are r quired when installing this type of condenser, althou a foot may be supplied in the larger sizes to take so of the weight from the pipe line.

Fig. 1 shows a reciprocating engine installation which a condenser is used for condensing and removi the exhaust steam. A centrifugal pump is employed supply the injection water and a gate valve controls pressure. The standard location of the necessa auxiliaries, strainer, check valve, and atmospheric rel valve are as shown. The hotwell is constructed wit weir built up from the bottom, in order to limit

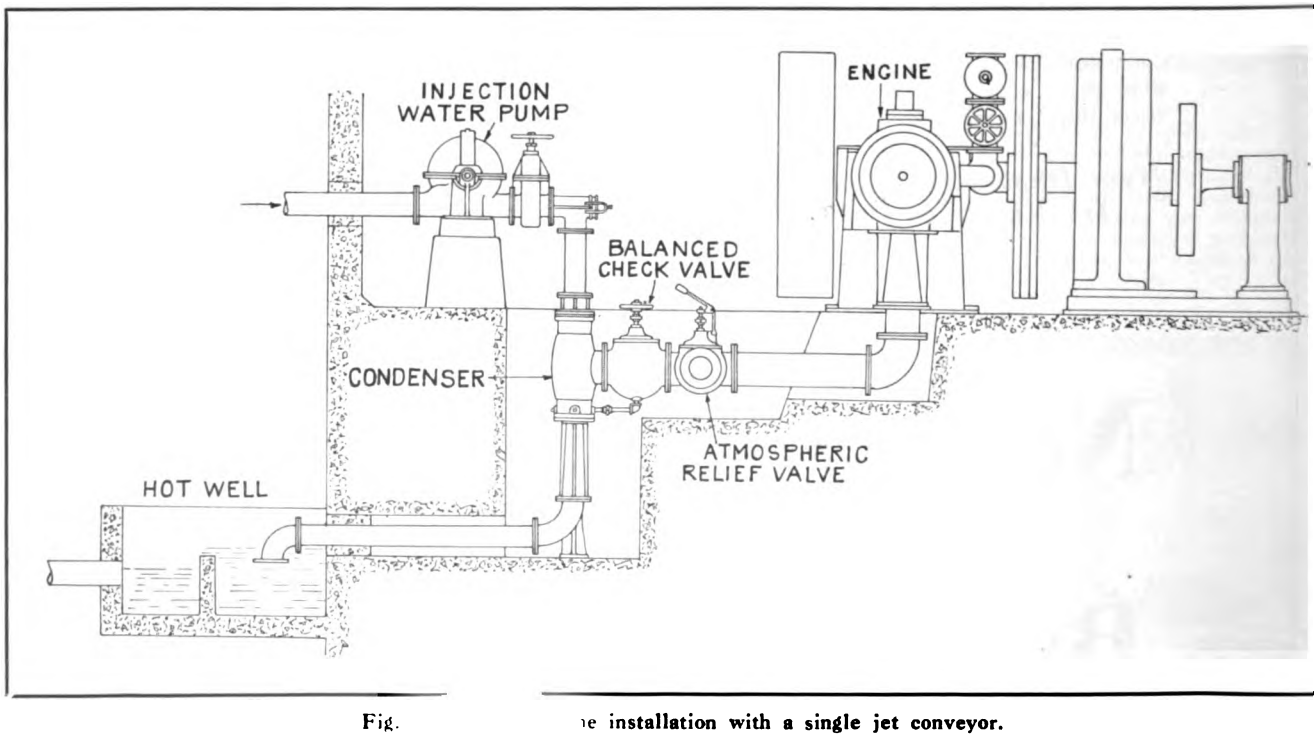


Fig. ıe installation with a single jet conveyor.

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amount of water that would be drawn into the condenser should the vacuum fail.

The single water jet is affected less than the multiple jets, by pulsations in the steam line such as occur in reciprocating steam engines, although these pulsations may be dampened somewhat by using a long exhaust pipe, or by fitting it with a receiver.

A condenser of this type may be used in a very efficient manner in connection with an engine driven refrigerating machine, having an overhead ammonia condenser. The arrangement of relief valve and check valve is standard, but the strainer is dispensed with and there is no auxiliary power required for supplying pressure to the injection water. This flows under a gravity head from the pan of the overhead ammonia condenser. The outlet of the pan leading to the condenser is tapered to insure an even flow of water and to prevent the entrainment of air which would interfere with the proper operation of the jet.

An installation of this type may be made with a continuous cycle of operations by using in connection with it a recooling system. The water from the hotwell is then delivered to spray nozzles by a circulating pump, where the heat is dissipated, and the water again circulated through the system. With such an arrangement it is necessary to adjust the pump and valves to balance the flow as nearly as possible, the variation being taken care of by an overflow from the pan to the hotwell.

The inductor type condenser is suitable for numerous other applications in manufacturing industries where vacuum equipment is necessary.

Fig. 3 shows a simple application to a vacuum kettle,

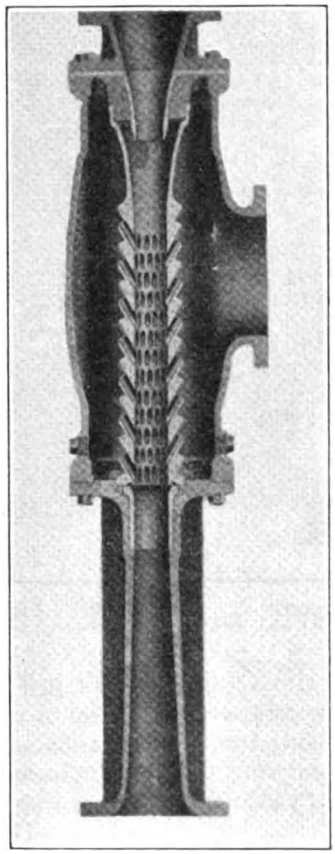


Fig. 2. Construction details of an inductor condenser.

such as is used in the manufacture of fruit, syrups, etc. If the amount of vapor discharged from the kettel is comparatively small, the temperature of the water while passing through the condenser does not increase more than a few degrees, and by allowing a small quantity of cold make-up water to flow into the hotwell, the injection water may be recirculated with a circulating pump, in case the supply of water is limited or expensive. The admission of the make-up water can be controlled by a thermostate, or if the operating conditions are fairly constant the supply may be controlled by hand.

If heating coils or a steam packet are used to heat the kettle with exhaust steam, a small steam turbine may be installed in the steam line to operate the injection water pump.

Where it is desired to remove a large quantity of air or gases from the exhaust line of an evaporator in order to facilitate the building up of the vacuum when starting the equipment, a small jet exhauster may be connected up to the exhaust line as shown in Fig. 4. This exhauster operates with live steam and is shut off when a moderately high vacuum has been established, after which the condenser maintains the vacuum.

In the process of recovering the sulphuric acid used in treating oil in oil refining processes where the acid is put through a concentrator, a condenser of the single jet type is a very desirable means of drawing off the vapors from the heated oil. Due to the simple construction of the condenser, it is a very simple matter to make the parts of acid resisting metal without excessive cost, thus insuring an inexpensive and compact installation which will operate with a minimum of corrosion.

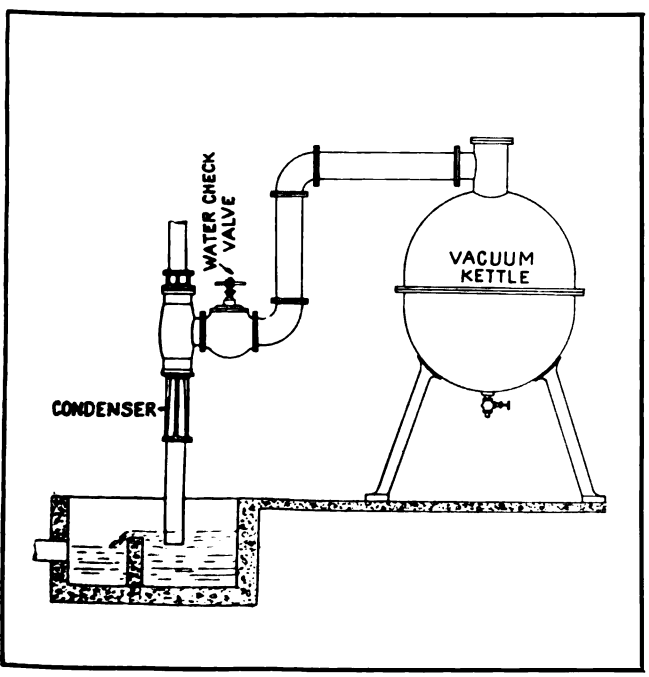


Fig. 3. A single jet condenser connected to a vacuum kettle.

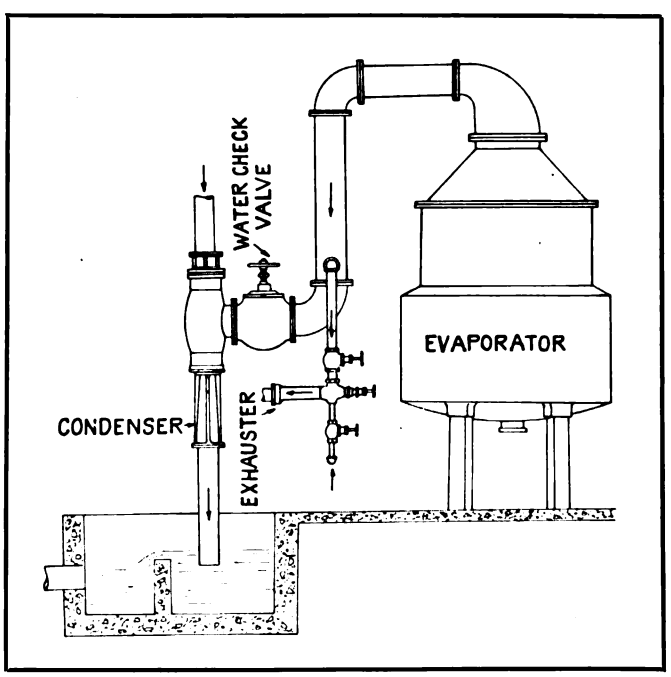


Fig. 4. An evaporator with a single jet condenser.

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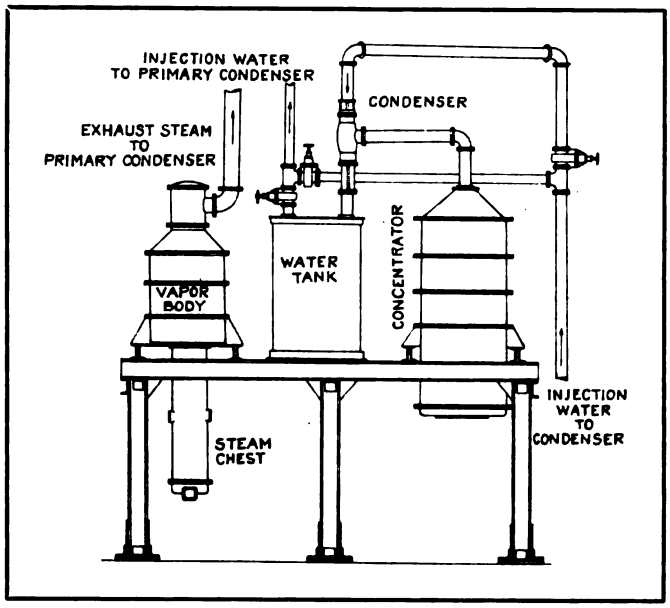


Fig. 5. A condenser with an acid concentrator (Martin's Process).

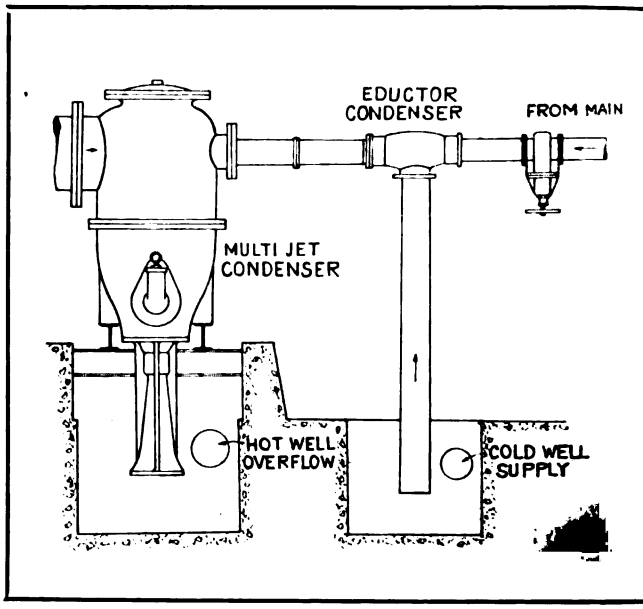


Fig. 6. An inductor condenser supplying water to a multi-jet condenser.

Another useful application is in connection with a water heating system where the condenser acts as a water heater. In this case water is supplied at pressures ranging from 1 to 15 lbs, per square inch, and the steam entering the condenser at pressures ranging from 15 inches vacuum to 11 lbs. gage.

Fig. 7 shows an installation of this kind arranged for both winter and summer operation. In cold weather the water discharged from the condenser is maintained at a high temperature, and although the vacuum is reduced somewhat it is still possible to operate at good efficiency. The condenser discharges the hot water through a check valve into a storage tank from which it is pumped through the heating system and returns at a lower temperature, at a sufficient pressure to be used again as injection water. During the summer the valves in the water line leading to and from the heating system are closed, and the water is taken from the cold well by the circulating pump and delivered to the condenser from which it is discharged to the hotwell.

In water syphoning systems such as are used in a water works, it is necessary to remove the air which collects the top of the syphon in order to maintain the syphon operation. A simpler method for accomplishing this r sult is to install a single jet condenser supplied with i jection water under a head from the lower level of t syphon. The condenser is kept in operation at all tim which necessitates the main valves being open a sufficie amount to furnish water to the condenser.

The inductor type condenser is designed with a high water rate than the multi-jet type, and is not general recommended for capacities greater than 10,000 lbs. steam per hour at high vacuum unless there is an abu dant supply of condensing water available.

These condensers are made in sizes ranging fr 1½ to 24-in. and with a steam capacity of from 150 45,000 lbs. per hour at 26-in. vacuum. The over height varies from 12-in. in the smaller size to ov 13 ft. in the larger condensers. Water consumpti in gallons per minute is equivalent to 10 per cent. of t steam capacity in lbs, per hour.

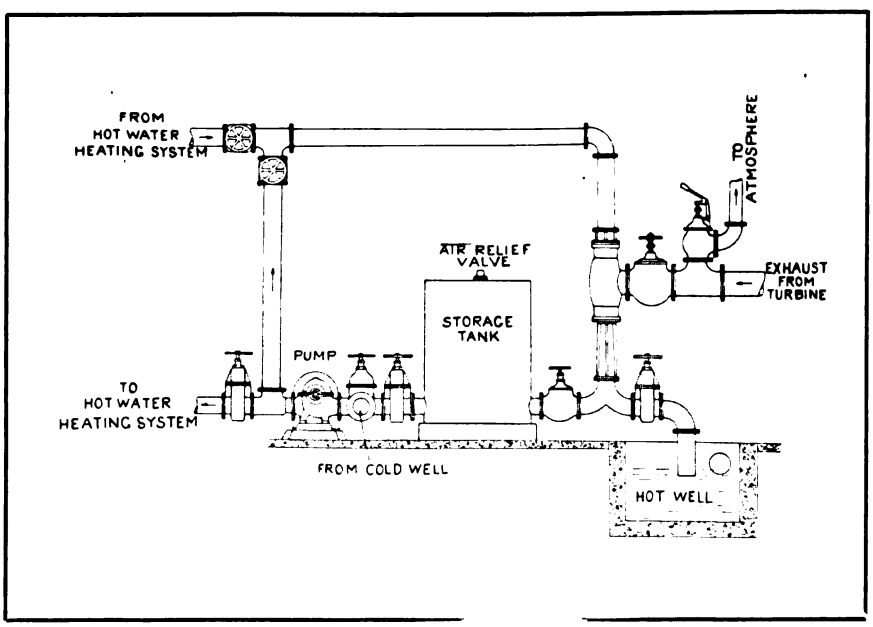


Fig. 7. A condenser arranged for both winter and summer operation. In cold weather discharge water is maintained at a high temperature and in summer the valves in the water line are closed.

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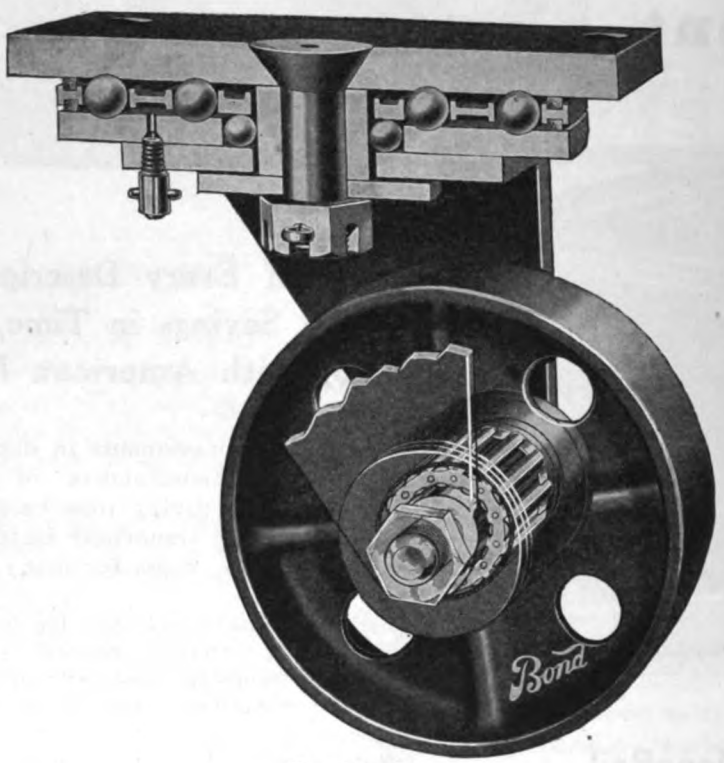
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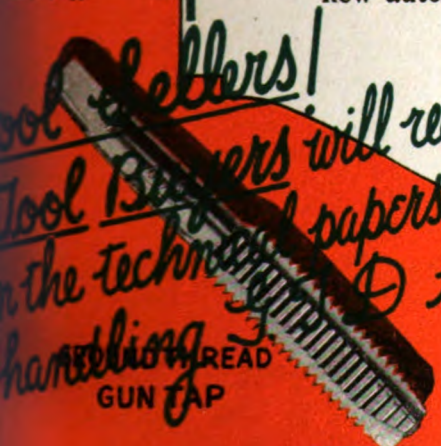
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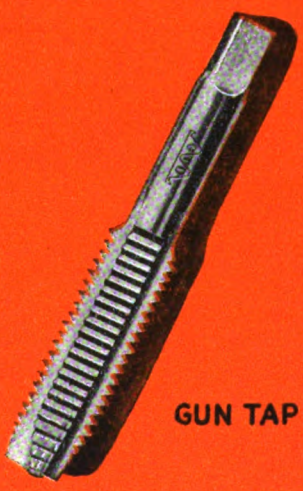
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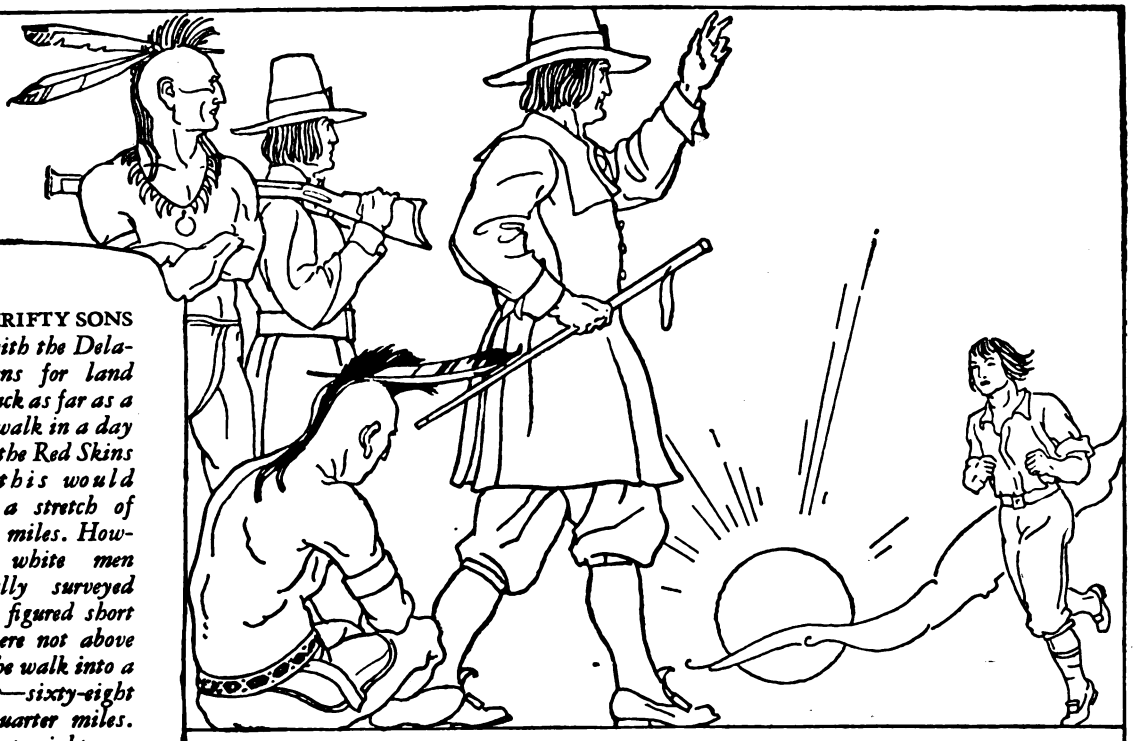
State

Come to Headquarters

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

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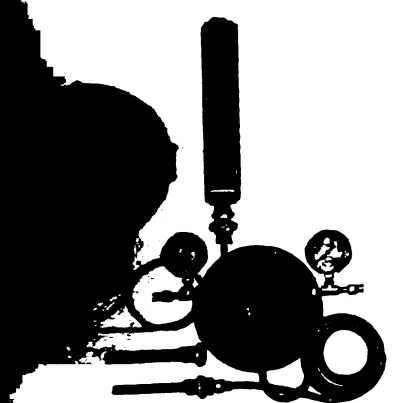
PENN'S THRIFTY SONS *bargained with the Delaware Indians for land extending back as far as a man might walk in a day and a half, the Red Skins figuring this would amount to a stretch of about thirty miles. However, the white men had carefully surveyed the ground, figured short cuts and were not above extending the walk into a run. Result—sixty-eight and three-quarter miles. Today property rights are matters of exact measurement.*

In instruments of scientific measurement there is no place for EQUIVOCATION

The world is past its childhood days. Whether it is right or wrong to dupe people is not the question. Today you cannot dupe them and hope to stay in business.

Added to this business essential of honesty comes the still greater obligation for accuracy in instruments of scientific measurement. For even a slight error may mean life or death in the sick room, may mean success or failure in the intricate processes of modern industry.

The Taylor Instrument Companies are inheritors of a sacred trust, for the early developers of the thermometer were men satisfied with nothing short of the truth. How they meet that trust is indicated by the fact that men of science, of medicine, of industry prefer *Tycos* wherever temperature is measured, recorded or controlled. There are over eight thousand styles of *Tycos* Instruments today telling the world facts—accurately.



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Grime, Carbon or Rust Scale encrusted on Factory Glass and Skylights without injury to Paint, Putty or Sash.

This modern cleaner instantly dissolves hard accumulations on your factory windows and skylights and is rinsed off with water, leaving the glass clear and bright.

Not an abrasive method—man can stand in normal working position and clean practically an entire section of glass.

Needs no experienced labor, in fact your own help can do this work at odd hours.

Five gallons cleans 4500 square feet. Average cost of both material and labor less than 1 cent per square foot.

One application of EVER-GLOW will convince you. Please order today. See trial offer below.

TRIAL PROPOSITION

If after using two gallons you are not fully satisfied return to us balance collect, and your invoice will be cancelled. 5 or 10 gallon keg at $2.75 per gal., ½ bbls. at $2.50 per gal., barrels at $2.25 per gal. Prices F.O.B. Cleveland. Brushes Free.

EVER-GLOW COMPANY

623 Union Bldg., Cleveland, O.

(Continued from page 22)

sheathing to protect the goods from dirt, water, oil, protruding points of other freight and the lips of the trucks used by factory, railroad, teamster and consignee truckers. This sheathing aids somewhat to the strength of the frame, but the frame and diagonal braces are the foundation of the crate, the sheathing being only a covering.

Watch a house being built! The situations are the same. If the house frame is weak the entire structure is weak and as a result the ceilings crack and fall and the clap boards and shingles are only added for beauty and protection.

In every case sufficient sheathing should be used on all faces of the crate to adequately protect the contents. The openings between the sheathing pieces next to finished surfaces should never be over three inches and preferably there should be no openings whatsoever in front of mirrors, glass or pulling surfaces. In shipping chairs and furniture and other similar items, sheathing should be used on the bottom faces of crates to protect the legs of the different commodities.

In the matter of selecting material for sheathing it should be understood that lumber thinner than the frame members may be used. The accompanying Table D gives information on this point.

Before preparing an article for shipment, thought should be given as to what conditions the article must undergo before it reaches its destination. Some consideration should be given to the length of the journey, the probable number of handlings, whether or not it is to be stored at any time in shipment, whether it is to travel into a hot, humid climate from a cold dry temperature or vice versa, or whether it is going to move by rail as well as by water. These points all have their bearing on the elimination of damage in shipment and crates should be constructed to prevent the occurrence of damage from any of the foregoing causes.

The first procedure in the packing of any article is to remove all detachable parts from the commodity. These should be well packed and shipped in separate containers or attached inside of the article itself or may be attached to the inside of the crate. Small denim or burlap bags should be used to contain casters, bolts or other loose metallic fastenings. A strong tough paper may serve as well but it is best not to use it. All drawers, doors and slides should be closed and braced or blocked shut; locking is not sufficient or safe. Grids, grates, attachments etc., should be fastened securely in place with twine, wire or by some other approved method which will not cause damage to the article which it is called upon to hold in place.

The crate must be large enough to entirely enclose the article or articles and no parts should protrude. Also a space of at least one inch must be provided between all finished surfaces and the inside of the crate. The article or articles also should be blocked, braced or fastened in such a manner that it would be impossible for them to move around inside the crate.

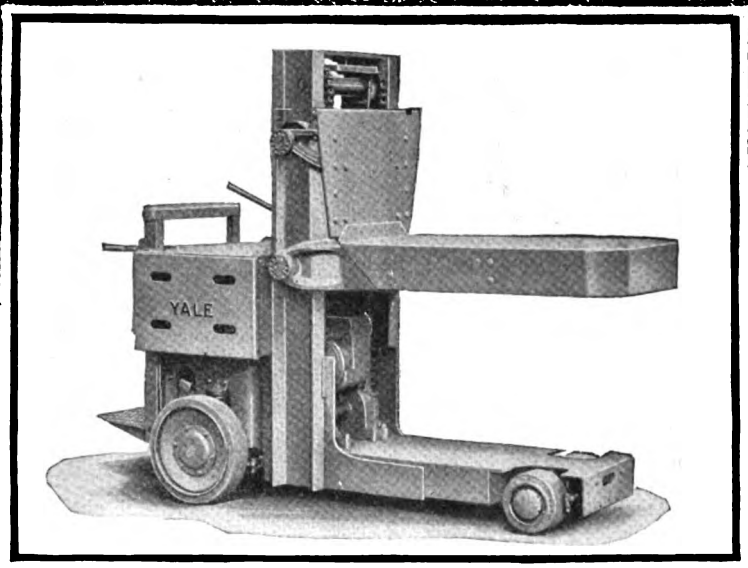
Support, suspend, or swing all atricles having legs which might be broken. Leave one inch between the bottom of the legs and the crate. Place inside bracing and blocking pieces against the strongest parts of the articles. Never nail braces or blocking by driving the nails into the end grain of the pieces. Top-heavy articles should be braced at a point higher than their center o

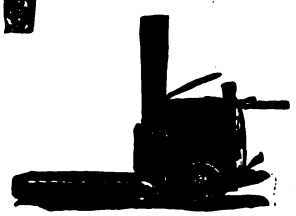
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YALE—the Key to lower handling costs. Chapter 42 on *Storage Battery Trucking.*

TRADE **YALE** MARK







Extra-ton Capacity in this new Yale K25 3-ton High Lift Truck

THE new Yale K25 3-ton High Lift Truck is now ready. It embodies every advantage of the Yale K22 (4000 lbs. capacity) Elevating Platform Truck with the added advantage of an extra-ton built-in capacity.

Here is a truck combining the wide range of speeds, power and load efficiency, long life, and ease of operation characteristic of all Yale Trucks, with increased lifting and carrying capacity.

The Yale K25 3-ton High Lift Truck carries such desirable qualities as improved vision and improved pressed steel side rail members, the same heavy duty controller with all contacts made of pure electrolytic copper and the same spur-geared power units as employed in all Yale Trucks.

The Yale Model K25 6000 lbs. capacity High Lift Truck will take the same ram attachments for handling coils and reels of wire, tin plate attachments for handling loose and boxed plate, pig lead attachments for handling pig lead, etc., that are regularly applied to the Yale K22 4000 lbs. capacity type of truck.

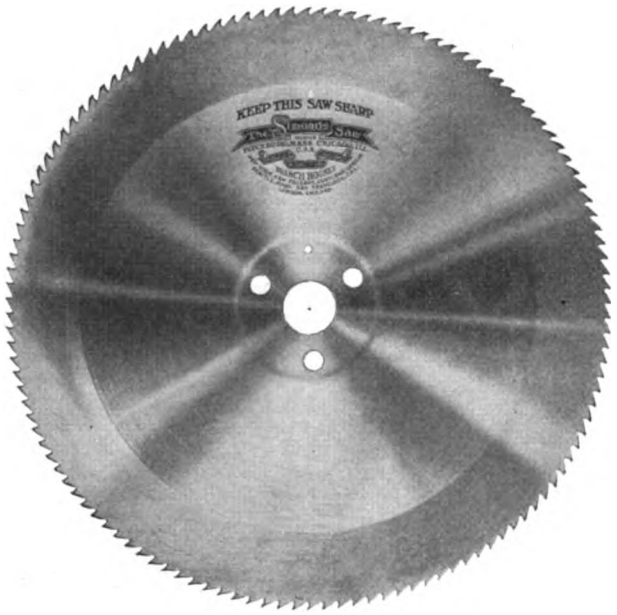
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YALE **Hoisting and Conveying Systems**

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SIMONDS
Metal Cutting
SAWS

Durable under severe service and reliable on accurate work. They are made of high grade steel produced in Simonds own steel mills, scientifically tested and tempered to a degree that proves up in performance. The cutting qualities of Simonds Saws permit of extra long runs at faster feed, which means more production.

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"The Saw Makers"
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New York City — Atlanta, Ga. — London, Eng. — Montreal, Que.

gravity. With furniture and other similar commodities this is usually accomplished by means of blocks and pads nailed to the ends of the crate and bearing against the sides of the articles near the top. Machinery can be braced by means of diagonal supports bearing against top of the machine and running to the base of the crate or to the skids. In some cases it is possible to fit a collar around the upright of the machine and attach this collar to the crate.

Too much stress cannot be placed on the importance of inside packing. If a crate looks good yet damage is occurring, look to the inside packing of the article and you will probably find the trouble.

Since there are numerous ways by which an article can be fixed in a crate, no attempt will be made to describe them all. Yet a few simple tests will serve as a guide in determining whether the method used is good or bad.

1. Shake the crate—is the article free to move?
2. Does the article hold up the crate, that is, is the crate built on the article or is the article placed into the crate?
3. Skew the crate—does the strain come on the article directly?
4. Is it possible to set the crate on its sides, front, back or top without seriously endangering the articles?

(This does not mean that all articles should be so prepared that they can be trucked and loaded in any position but rather is there any provision made to protect the article under these contingencies?)

Government Urges Use of Short-Length Lumber

BY ordering short-length lumber from the mills instead of sawing it from full lengths it would be possible to increase the lumber output of the United States by one fifth without the felling of an additional tree or the investment of an additional dollar in mill equipment, it is declared in a report by a governmental committee headed by Herbert Hoover, Secretary of Commerce. Under the present practice, no short-length lumber is produced at the mills. This results in the wastage of short-length logs—an extravagance which dates back to the time when the timber supply of this country was believed to be inexhaustible.

The report, made public by the Department of Commerce, is the work of the National Committee on Wood Utilization appointed by President Coolidge to bring about a fuller utilization of the country's timber resources. The committee comprises over 100 members, and represents manufacturers, distributors, and consumers of lumber and wood products. Photographs, charts, and figures are presented to show where short-length lumber could be used at a saving of from 15 to 35 per cent. present prices quoted at the mills. The substitution of short lengths for long ones is particularly applicable in the construction of small homes and farm buildings.

Summarizing its findings, the committee states that "the saving of tens of millions of dollars annually in construction and the conservation of billions of feet of soft wood lumber are two great economies that can be effected by the use of short-length lumber."

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NEW CARRYING CASE

In the illustration above the Dumore No. 2 AG Grinder appears in the new steel carrying case. The case is designed to hold the grinder and all equipment. This feature makes it easier to carry the grinder from one job to another. Both No. 2 AG and No. 3 Grinders will now be shipped in these steel cases.

DUMORE
Electric Toolpost Grinders

ACCURATE FINISHING

ACCURATE finishing is essential to modern toolroom and machine shop work. Dumore Grinders maintain the required accuracy on close limit external and internal precision grinding, on large and small work.

Every Dumore Grinder is dynamically balanced. Speed ranges are variable, 3,600 to 50,000 R.P.M. These features eliminate vibration and provide correct speed for all sizes of grinding wheels used. Correct speed and absence of vibration insure the grinding wheels cutting freely without breaking down—eliminating taper, bellmouth and chattermarks.



FREE—Tap Drill Chart
Mail the Coupon ☞

WISCONSIN ELECTRIC COMPANY,
70-16th Street, Racine, Wisconsin.

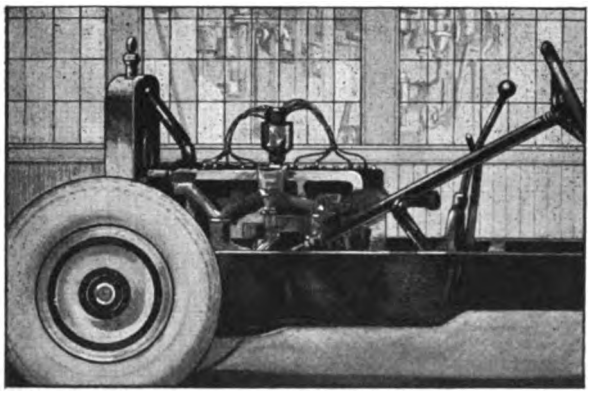
Please send me a FREE tap drill chart. Also explain your exchange plan on Dumore Grinders.

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. . . to Less Than a Hair's Breadth

The measured thickness of a hair is about two thousandths of an inch—twice the tolerance allowed in grinding pistons for many fine automobiles.

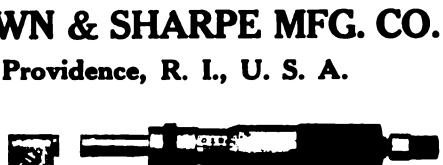
Split hair accuracy is required in making the modern motor car. On the careful fitting of many parts depends the proper performance of the complete machine.

Every working day, in the hands of practical mechanics all over the world, Brown & Sharpe Tools are used in doing accurate work—work where a variation of one thousandth of an inch is all that is allowed.

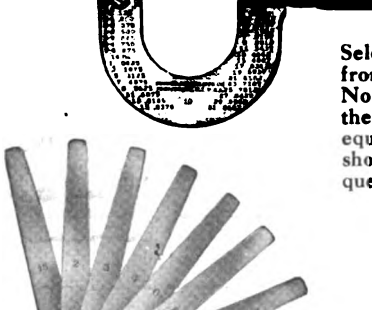
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BROWN & SHARPE MFG. CO.

Providence, R. I., U. S. A.



Select your tools from our Catalog No. 30 if you want the finest tool equipment in your shop. Sent on request.



B·S

BROWN & SHARPE TOOLS

"World's Standard of Accuracy"

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(Continued from page 26)

fastener because the belt cannot follow the periphery of the pulley.

It is usually the case that production suffers more from improper and careless belt joining than from any other transmission factor, because it is the vital link of the power belt and when it breaks or pulls out this medium of power is useless until the joint is repaired. The belt in itself is impotent. It must be joined correctly before it can deliver its full quota of power to the machine.

Undoubtedly the modern method of making leather belting and some ply fabric varieties endless is by far the most efficient, from a power transmission and safety standpoint, because the joint is integral with the belt and eliminates the use of any foreign element in connection with the belting substances. When a belt is endless, the joint has the same flexibility as the transmission medium itself and grips the pulleys with the same frictional contact.

Various metallic fasteners have been selected and applied which give a belt joint that is practicable and efficient; nevertheless, there is always a certain amount of stiffness at the joint which causes the belt to jump or pound as it bends around the pulleys and particularly so when the pulleys are of small diameter. This jumping or pounding, no matter how slight, causes slip, and slip is loss of power delivered. On high-speed accurate grinding operations an endless belt is imperative, because any metallic fastener will cause a vibration, which in shop vernacular is called "chatter," and this is disastrous to the perfection of the piece being ground. With the endless belt there is no "chatter" because in reality there is no joint. However, there is one great drawback to the general use of the endless method and that is the natural and unavoidable, initial stretch of a belt very shortly after it goes into operation.

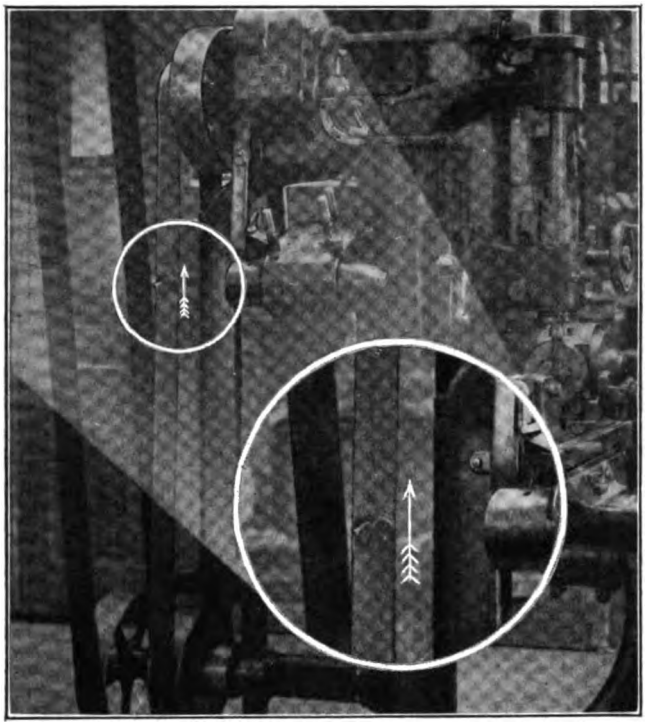
Frequent cutting is necessary if there is no means of adjustment or take-up, and continuous recementing consumes valuable time in production operations; therefore the economy of the metallic fastener for the general belt driving of a production factory. Direct belt-driven machine tools, motor drives to group line shafts and idler tightener installations should be equipped with endless belting, because initial stretch take-up can be quickly adjusted and with the tightener it is automatic.

It is most desirable when considering an endless drive to have the belt made by the manufacturer, but, of course this is not always possible, therefore, in most cases it is done at the plant. If care is exercised in making an endless or cemented joint the results are most satisfactory, but if it is performed in a careless manner this type of joint then becomes a hindrance to power transmission and a source of danger, particularly on high power drives, because if joined crooked the belt will run out of line, and if poorly cemented will part quickly when under load.

In the large production industries of the country the great majority of power transmission belting employed ranges in width from 1 inch to 8 inches and at least seventy-five per cent. of this belting is joined by the individual wire hook hinged method. The writer bases these facts upon his detailed analysis of thousands of installations. The general use of this type is no doubt caused by the multiplicity of small pulley, high-speed operations and the ease and accuracy with which this type of fastener may be applied by machine. However, certain imperfec-

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SCHIEREN BELTS DO LAST LONGER



What is wrong with the belt in this picture?

Rubbing on pulley flanges, belt guides, etc., will open up laps, just like the one here, if the belt is run in the wrong direction as is the case with this one. It pays to watch your belting and to put it on right.

Different from all other belts

No other belt is like Duxbak because no other oak-tanned belt is quite as pliable. Scouring removes the tanning grit leaving the leather pliable and free to bend without effort.

Duxbak Belting is unique in its pliability. And it seems reasonable to believe that the more pliable belt lasts longer. Our experience proves it. That is why we continue to make Duxbak different from all other belts.

Let us send you a copy of L. H. Hopkins' article,
"Group Drives More Economical for Most Conditions."

DUXBAK BELTING

Chas. A. Schieren Company

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Distributing Branches and Dealers in All Leading Cities Throughout the World

DUXBAK WATERPROOF LEATHER BELTING

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Should any motor have a "compensator" today?

Here's the answer!





The TR Super-Motor—*no compensator in any size*—applied on *running, not* starting load. Cuts first cost and current costs. Lowest cost push-button control. Write for bulletin.

Here are 44 TR Super-Motors driving rendering tanks in the Indianapolis Garbage Disposal Plant. Motors are thrown across the line by automatic switch (no compensator) and they bring the agitators up to speed in about 3 minutes. Other makes of 15 hp self-start and squirrel cage motors proved incapable of starting the load. Unless 15 hp TR's were used, 20 hp motors were required.

Just another example of how and why the modern TR Super-Motor saves money. No compensator, and a 25% to 60% smaller motor! When the application engineer says "compensator control" that's the time to change to TR Super-Motors and a push-button!

Get the facts about the TR Super-Motor and learn how to cut your power-costs. Send for Coupon!

THE TRIUMPH ELECTRIC CORPORATION

Builders of squirrel cage, slip ring and TR Super-Motors since 1892

157 East 70th Street **Cincinnati, Ohio**

La Salle Grinders

For Precision and Production



No. 1 Plain and Surface Grinder

(Micrometer Adjustment)

Grinding wheels .....8"x1"
Between wheels .....15"
Height to spindle center.40"
Table surface .....8"x14"

Has vertical travel of 12" on guides, ¾" by micrometer, and may be raised to within 2" of spindle center. Wheel grinds to center of a surface 9" wide.

Spindle speed....2450 r.p.m.
Countershaft speed.800 r.p.m.
Floor space .....18"x24"
Net weight .....300 lbs.

PRICE $115.00

La Salle No. 1 is equipped with every attachment to promote simplicity and speed in operation. The horizontal hand wheel carries a dial graduated to 1000ths of an inch, and as the divisions are 5 32nds of an inch apart, finer adjustments are easily obtainable. The knee may be brought to any position by means of the vertical hand wheel. Reamed bearings assure perfect alignment. Within its capacity no tool is more generally useful in tool room or shop. *Its use insures precision.*

ALSO MANUFACTURERS OF

No. 2 Automatic Surface Grinder
No. 3 Surface Grinder (dry)
No. 3 Plain and Surface Grinder (dry)
(Extra Wet Attachments for No. 3)
American Twist Drill Grinders, priced.

La Salle Grinders will satisfy your needs. Let us help you solve your grinding problems.

LA SALLE TOOL COMPANY
OTTAWA, ILLINOIS, U. S. A.
La Salle County **Formerly of La S**

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tions with this method of belt joining have given the manufacturers of this type opportunity for improvement and they, realizing the field for its application, are continually endeavoring to perfect the wire hook and particularly the machine for applying it—all for the ultimate good of the consumer. The usual method employed for applying this type of fastener is the portable hand operated machine which has proven most efficient, but it has always possessed two drawbacks: namely, the time consumed in making the joint and the machine's dependence on the operator for its hook-embedding capacity. For satisfactory performance and long life, this style of hook must be embedded in the belting substance to such an extent that when ready for operation it is flush or slightly below the surface of both sides of the belt. The portable hook lacing machines are capable of accomplishing this but the extent of penetration is entirely dependent on the human element. Two men are required, at times, to make an accurate joint with this type of machine.

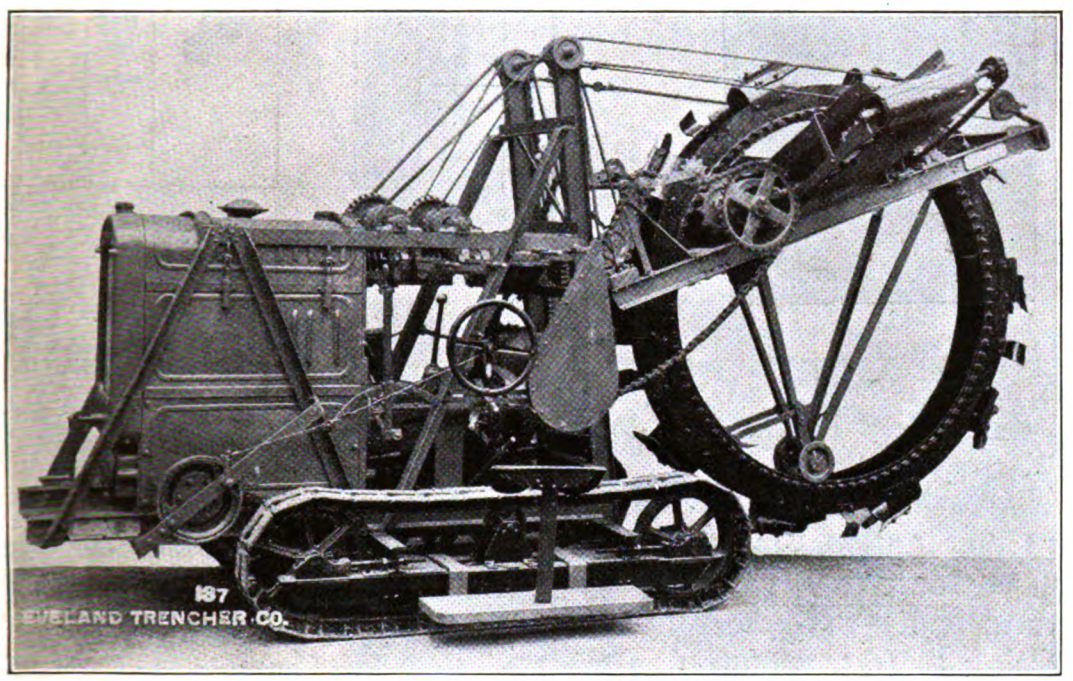
That manufacturers of belt fastening appliances are awake to the needs of industry is proven by the fact that they have sensed the faults of the present machine and have recently placed on the market a light weight stationary, wire hook belt-lacing machine of exceptional advantage and efficiency. By its use the two principal difficulties of the portable machines are overcome, because a belt can be laced in about one-half the time and full depth penetration of the wire hook is always assured. The embedding of the hook and the pressure applied is not dependent on the operator. A three quarter turn of the operating crank creates a pressure of approximately 46,000 pounds on the jaws of this machine, due to an entirely new principle of design; therefore, the hooks are embedded in perfect alignment on a 1 inch or 8 inch belt absolutely flush with the surface of the belt. This prolongs the life of the lacing and reduces the wear on the hooks and pulleys to a minimum.

Improper and careless belt joining is a steady drain on production, one of the principal factors of mechanical power transmission maintenance costs and a direct cause of short belting life. It behooves the power transmission users of the country to investigate their belt joining methods and conditions and to realize that the manufacturers of belt fastening appliances are continually endeavoring to perfect their products for the purpose of improving the transmission of mechanical power in industry.

THE business man who would look ahead with some degree of certainty as to what may be expected in the growth and development in his particular line of activity must keep himself well informed regarding the progress of business generally. It is no longer sufficient for a man to understand fully his own line of business. The times call for men with broad vision who keep constantly before them a mental picture of the combined business operations of the whole country and then shape their own course by that compass.—*La Salle Extension University.*

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TWIN DISC CLUTCHES



Cleveland Trencher Company "Baby Digger" trenching machine equipped with Twin Disc C-8 Clutch.



POSITIVE in action, yet built so they can be slipped if necessary without heating or undue wear, Twin Disc Clutches prolong the life and increase the working capacity of any machine that has to operate under widely varying load and service requirements.

Consult with our Engineering Department.

PARTS STATIONS

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Los Angeles—Coast Machinery Corporation, 406 E. Third St.
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Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.
Tampa, Fla.—Motive Parts Co. of Florida, Inc., 708 Twiggs St.
Detroit—Whitney Brothers, 6464 Epworth Blvd.
New York City—E. George & Co., Broome & Wooster Sts.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie St.
Cleveland—James R. Howell, 6715 Quimby Ave.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.
Buffalo, N. Y.—Edward W. Rode, 45 A St.
Pittsburg, Pa.—Motive Parts Co. of Pa., 6314 Penn Ave.

TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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ILLINOIS Eclipse Combination Blast Trap

Extremely sensitive and efficient, the *Eclipse* Combination Blast Trap is unsurpassed for **Quickly** removing the air and water of condensation from Unit Heaters, Vento Coils, Stacks, Dry Kilns, etc.

When the heating system is started, air is rapidly vented through the Thermo by-pass and quick and positive steam circulation is thus obtained.

Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving the maximum heat from steam used.

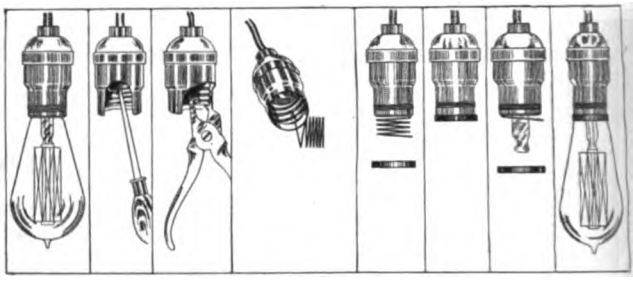
No. 15 Drip Trap (furnished in nickel plated finish) is extensively used on Sterilizers, Steam Kettles and similar apparatus.

Write for Bulletin 133

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPORATED 1900
CHICAGO

A Lock for Electric Light Bulbs

A SIMPLE and effective lock to prevent the theft of electric light bulbs has recently been put on the market by the Ren Manufacturing Co., Winchester, Mass. It is called the Ren-Lock. It consists of only two parts, a coiled spring and a grooved ring. A special punch is used to attach the lock to the socket. This device can be used with standard electric light bulbs and standard brass and porcelain sockets.



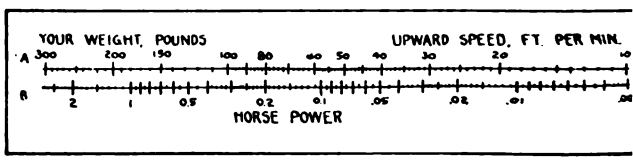
What Is Your Horse Power?

By S. F. Williams

WHEN you talk or run up hill or up stairs yo are generating a certain "horsepower."

The heavier you are and the faster you move upwar the greater horsepower you develop.

If you wish to determine your own horsepower it c be done in a very simple way by first weighing yours and then with your watch and a yardstick determine t number of feet you can move upward per minute agai gravity.



The accompanying chart will then tell your horsepow Find your weight in Column A and your upward sp in feet per minute, also in Column A. Then find point in scale B that is exactly half way between the t points already located in Column A. The mid-point Column B is your horsepower.

For example, if you weigh 150 pounds, and if you move upward at the rate of 60 ft. per min., you ar "0.28 horsepower human being." In other words, that rate of moving upward you develop but little n energy than a ¼-horsepower motor.

The strongest human being in the world is really very powerful. It is foolish for anybody to attemp do manual labor that can be done better via heat mechanical energy. Actual tests have shown that du an 8-hour day a laborer can do only about one-tenth one horsepower throughout the day. For a few min a laborer can do as much as one-half horsepower, w isn't very much.

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Waterproof Your Building So It Could Stand Under Niagara!

Hydrocide

Colorless Waterproofing

YEAR after year, building walls must fight the weather. Without protection, hey are worn down by the elements. 'enetrated by moisture. Marred by dis-olorations.

'rotected by Hydrocide Colorless Water-roofing, walls stay young. Ward off moisture. Retain their beauty. This is because Hydrocide enters stone or brick and makes these substances water-tight.

Hydrocide corks every pore deeply and cannot be abraded. This is its advantage over waterproofings which form a film that in time is either broken or worn away.

Some Other Sonneborn Products

LAPIDOLITH
:netrates concrete oors as Hydrocide olorless penetrates our walls. Makes hem granite-hard, ustless, lasting.

LIGNOPHOL
the only wood floor preservative that lasts. Linseed Oil is useless. Shellac and Varnish wear off. Lignophol stays.

CEMCOAT
reduces painting costs. It does not yellow. Has a glass-like surface that won't crack, peel or blister. Washable.

.. SONNEBORN SONS, INC.
114 Fifth Avenue, New York

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Please send me, without obligation, demonstration samples and literature on: —Lapidolith ...; Lignophol ...; Cemcoat ...; Hydrocide Colorless ...
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MEDART
Flexible
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You can correct unavoidable shaft misalignments with MEDART Insulated Flexible Couplings. Designed specifically for connecting shafts that are not in proper alignment—either angular or lateral and that are liable to get out of alignment through shocks and jars. Simply built—powerful—trouble-proof. Particularly advantageous in motor drives—they act as shock absorbers between driving and driven machines. Indorsed by thousands of users. Immediate shipments on instant notice.

Get Medart Catalog No. 43 and discount sheet — for Everything in Line Shafting Equipment and Bulletin on Timken - Equipped Line of Industrial Applications.

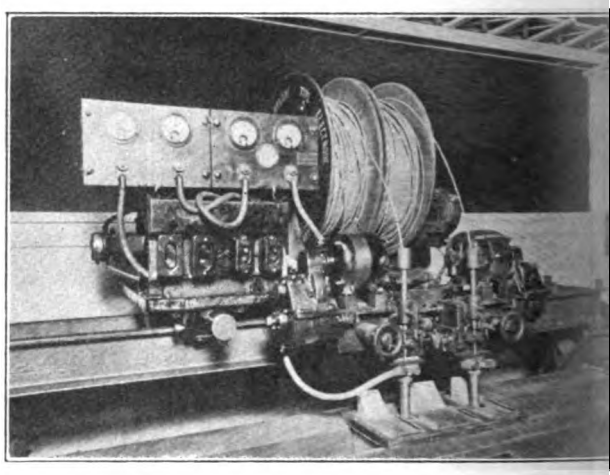
THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
Office and Warehouse in Cincinnati
Manufacturers of Power Transmitting and Kindred Machinery

MEDART
Everything in Line Shafting Equipment

Higher Welding Speeds Possible

WELDING heavy plates automatically at approxi mately ten times the speed which can be ob tained with the single-arc manually controlled process i now possible with a new automatic arc welder The ne machine bears the designation Duo-Arc Automati Welder and consists of a standard travel carriage o which are mounted two automatic welding heads, an two reels of electrode wire. With this equipment, th manufacturers claim, the operation is just as simple a that of the single arc travel carriages. One attendant ca supervise the two welding arcs as easily as he can one ar

The new welder is of particular value in butt weldin heavy plates. This is accomplished by two electrode working one behind the other simultaneously. Thus th necessarily large quantity of metal required to fill up th seam is deposited in practically one-half the amount time which would be required for the travel of o electrode.



The ordinary method of depositing the required thi ness of metal in welding heavy plates is to weld tw with a single electrode over the same seam.

By using two electrodes, welding simultaneously, time required to repeat the welding with a single electr is saved.

An electrode larger than ¼-inch in diameter is commonly used for high grade work because the dep tion of metal cannot be accurately controlled and i inconvenient for operators to handle the large amou of electrical energy necessary, concentrated in a sin arc.

For welding half-inch plate, the seam is prepared beveling to an angle of 30 deg., total opening. W 3/16-inch electrode and approximately 250 to 300 peres in each arc, a speed of welding of from five to se inches a minute may be obtained. Thus the speed welding is approximately ten times that obtained wi single arc manually controlled and the resulting wel of better quality because of the decreased chance burning the weld.



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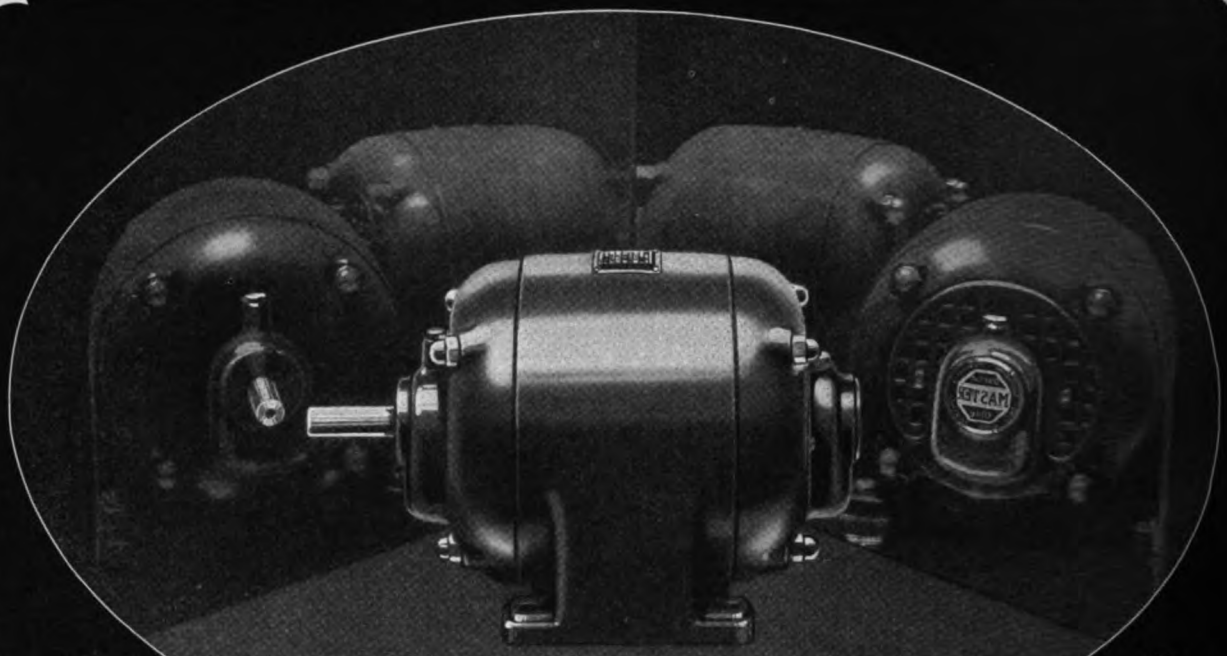
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NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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Good from Every Angle

DESIGN • CONSTRUCTION • PERFORMANCE

It has arrived!

A NEW MARVEL OF MOTOR PERFECTION

The latest achievement of Master Engineers is the Super-Wick Motor. While the success of the Master Dual Wick Motor over a period of years has been faultless, the Master Super-Wick is still a greater refinement.

SOME OF THE REFINEMENTS ARE:

A very *compact design.*

A large oil and wick reservoir with sufficient *oil capacity for one year's operation without reoiling.*

The use of *special, long, non-hardening wicks* having greater oil lifting and absorption capacity.

Positive means used to insure a *circulation of filtered oil* to the shaft at all times.

No oil leakage—inside or out.

Bearings sealed against dust or dirt.

Reversing arm which makes it *easy to change direction of rotation.*

More pleasing appearance throughout—nickel plated trimmings used.

More thoroughly enclosed affording *better protection to the windings.*

There are many others—write for complete information.

THE MASTER ELECTRIC COMPANY
Linden & Master Aves., Dayton, Ohio

STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P.

Dayton
THE MASTER ELECTRIC CO.
Ohio

Less than 40°

dvertised in this issue write Industry Illustrated

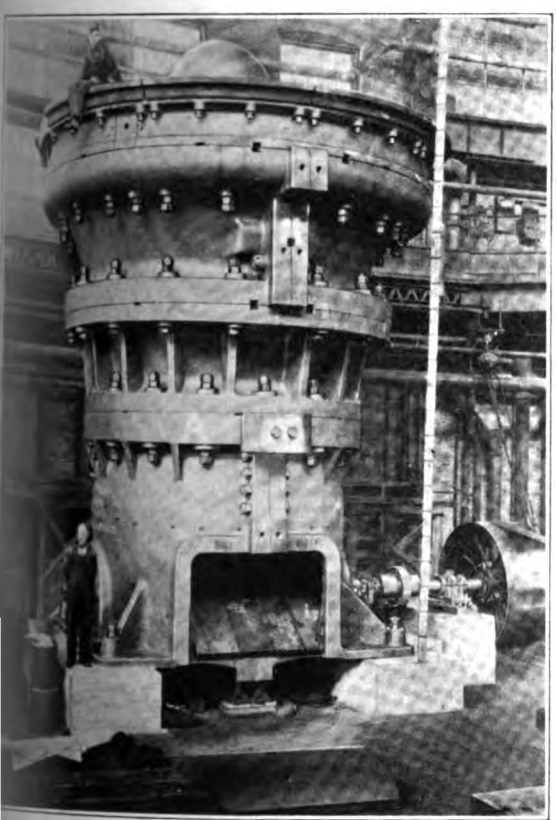
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Large Ore Crushers Traverse Two Oceans

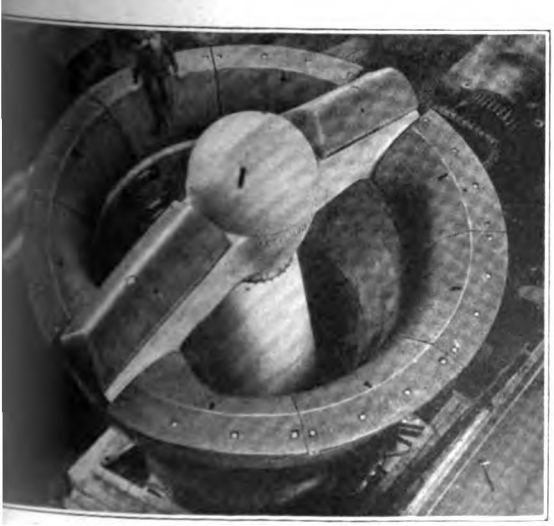
By George F. Paul

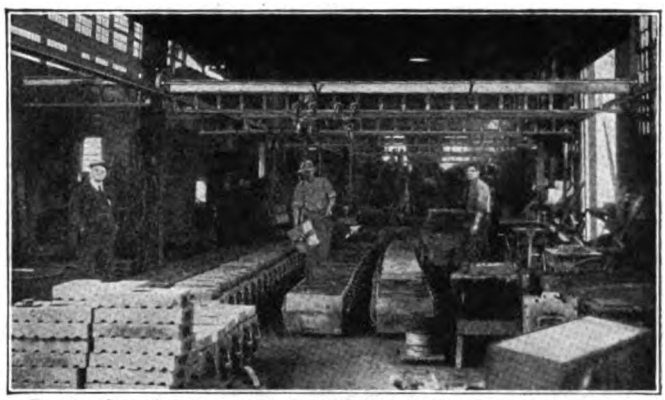
"BIGGER and more powerful machines" is the cry of the age. Industry is demanding larger and more powerful equipment to do the world's work.

This is shown by the recent completion in Milwaukee of what are declared to be the two largest ore crushers ever built. They weigh a million pounds each, and were



cially designed for the Chile Exploration Company be installed in the Andes Mountains, Chile. As these shers are to handle extremely hard copper ore, they re built almost entirely of steel. A whole carload of 70 tons, can be dumped into the crusher at one time. ne of the single pieces of ore will weigh as much as en tons. However, this will not prove a hardship for





Pouring direct from Louden Push and Pull Traveling Cranes in the foundry of the Bagley & Sewell Co., Inc., Watertown, N. Y. Ladles brought from cupola to molds on Louden Monorail.

"Moving is 90% of the making"

Move Faster!

"The biggest cost savings of today and tomorrow are likely to come from moving rather than from making. This is the Decade of Mechanical Transportation."
—JOHN H. VAN DEVENTER
Authority on production management.

What of your production? Is it speed-geared to greater economy and increased profits? *Look to your ceilings!* That's the place where you can effect your greatest savings in time, man-power and costs. Put it to work by installing a Louden Industrial Monorail System.

During the past ten years thousands of miles of Louden Monorail have been laid on that last great trackless waste of industrial America—the unused ceiling.

No plant is too small, none too large to profit by the installation of this system. Yours is no exception. What other plants have done you can do—speed up production, eliminate exhausting work, relieve congestion on the floor, lessen labor turnover, co-ordinate moving and making.

Today is the day to give a moment of your time to finding out the profit-making possibilities of Louden Monorail in your plant. Send for our valuable book on material handling.

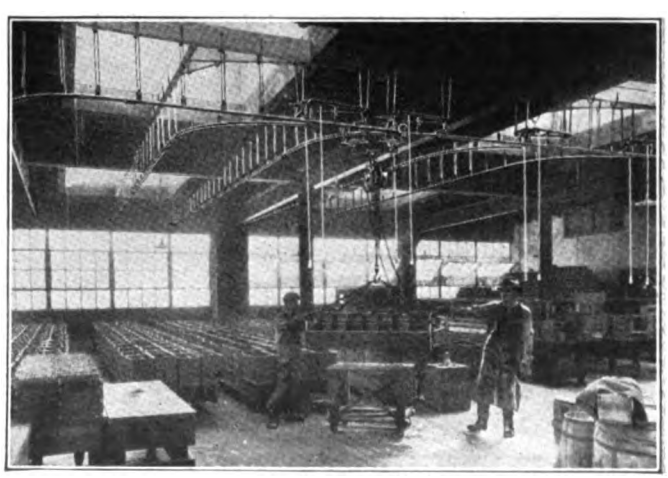


Send today for this invaluable book on material handling

It tells a remarkable story about the conveying of materials in process of manufacture, handling finished products, etc. 56 pages of dimensioned drawings; 72 pages illustrating application of Louden Monorail to many types of work, including yours, complete information on track, trolleys, switches, dipping machines, cranes, monorail scales, track hoists, etc. Shows how to cut production costs Write for your copy.

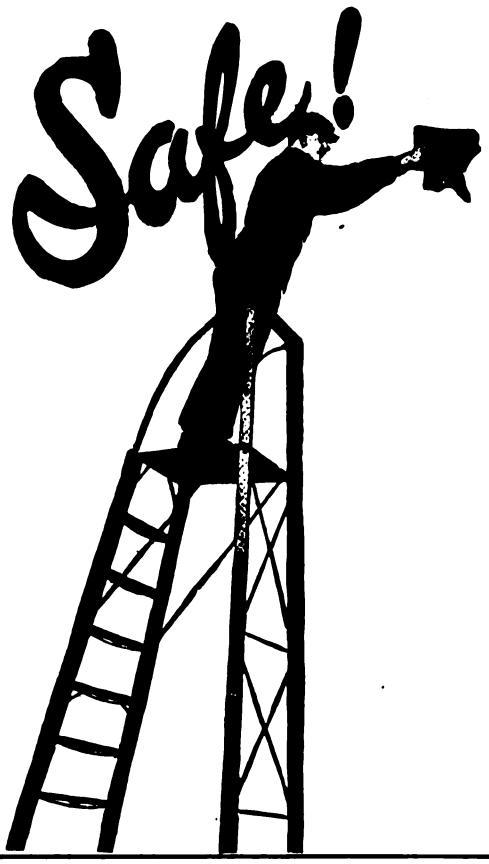
THE LOUDEN MACHINERY COMPANY
704 West Ave. *(Founded 1867)* **Fairfield, Iowa**
Albany Boston New York Philadelphia Buffalo
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LOUDEN INDUSTRIAL MONORAIL SYSTEMS
(for Overhead Lifting and Carrying)



Speed in moving heavy batteries, attained by installation of the Louden Monorail in this Pittsburgh plant. Inexpensive to install!

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The safe workman is a fast workman

The worker standing on a Dayton Safety Ladder has no fear of tipping or falling. He uses both hands, gives his entire attention to the job, works faster and better.

He can work overhead or extend his hands to his full reach, as confidently as though standing on solid ground, from the wide platform of the

DAYTON Safety Ladder

The Dayton—the only safety ladder—stands four-square, with wide leg-spread, braced with steel rods and trusses. Cannot tip, collapse, sway, slide or wabble; yet folds compactly when not in use. The solidly braced platform, with high guard rails, affords ample foot and tool room for two men. No lost time going up and down the ladder for tools, no slowing up on account of uncertain footing.

Dayton Safety Ladders are made from steel braced aeroplane spruce, in sizes from 3 to 16 feet. They are reducing accidents, speeding up work, cutting maintenance costs in modern plants everywhere. They will do the same in your plant.

Write for complete information. No obligation.
Dept. I. 5.

The Dayton Safety Ladder Co.

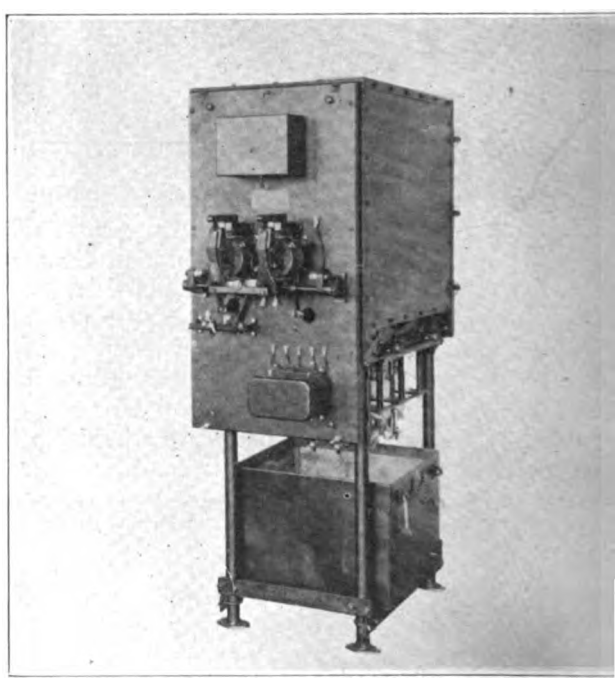
121-123 W. Third St. ·ti, Ohio

either of the crushers, for each is capable of handlin 2,500 tons of ore an hour, reducing it to a 12-inch prod uct.

Of course, considerable planning has been required t figure out how to land these two monsters safely in dis tant Chile. With the long trip in view, they were bui in sections. The largest pieces are a mere 60 tons eac To convey this shipment to New York, 25 freight ca have been required. The shipment will travel south b way of the Panama Canal, and will follow the west coa of South America to Mejillones, a port near Antaf gasta, but really it is not much of a port, for the m chinery will all have to be transferred to lighters, tow in to shore, pulled on to the beach, and transferred cars on a 30-inch narrow gauge railroad. Then up a up and up,—nearly 10,000 feet above sea level. He if all goes well all along the way, the giant crushers w find a home,—and not rest, but work.

Dust-Proof, High Voltage Automati Compensator

A NEW General Electric automatic compensat of dust-proof design for high voltage service, recommended for use where dust is excessive, such coal crushing plants, flour mills, etc. This device ha maximum rating of 65 amperes at 2200 volts.



The side and top covers are securely bolted to a iron straps. The back cover is removable but, wh place, is held there by spring clamps. This back gives ready access to the current transformers, auto-t formers, wiring and contactor-operating mecha The front cover is securely clamped to the base w flange and gasket around the edge. The compensa arranged for conduit wiring. The conduits enter back through a bushing plate.

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TWO MILLION MOTORS ARE MARKED "KT"

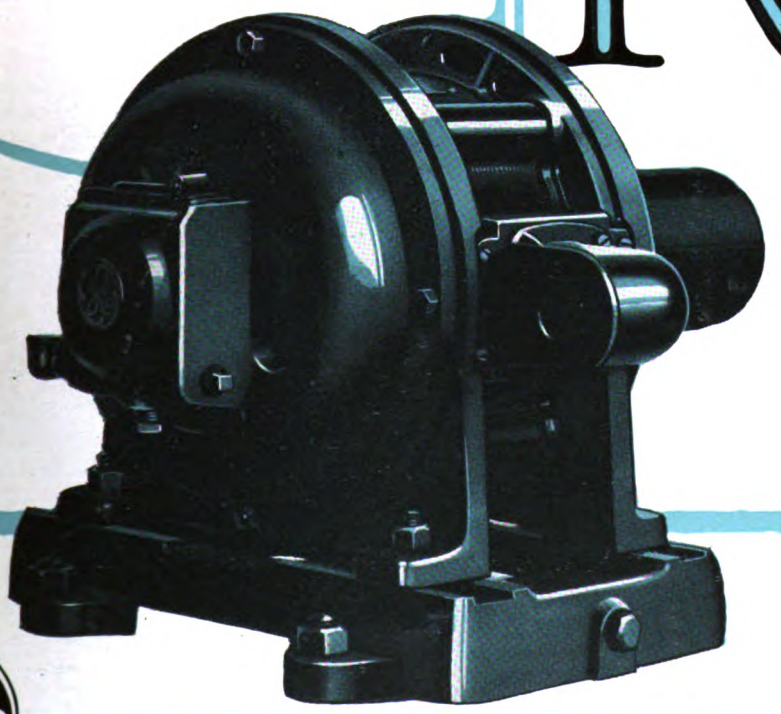
Two million Type KT motors have been sold to industry.

Type KT has earned its reputation for precision in mechanical and electrical design, for integrity of materials, for care evidenced in the finer details of construction, for excellence of operating characteristics, and for dependability under the stress of hard service.

Users may continue to rely upon the maintained reputation of Type KT.

TYPE

KT

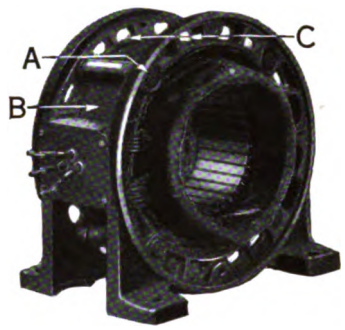


GENERAL ELECTRIC

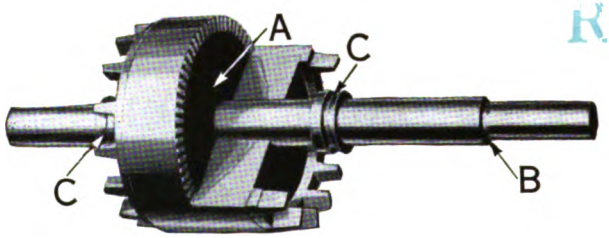
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TYPE KT

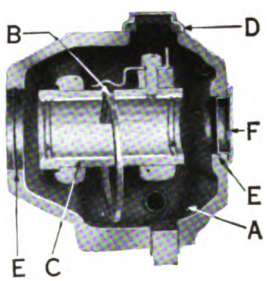
From designing board to testing bench, *precision* rules the making of "KT" motors—each motor must maintain the reputation of the "KT" line.



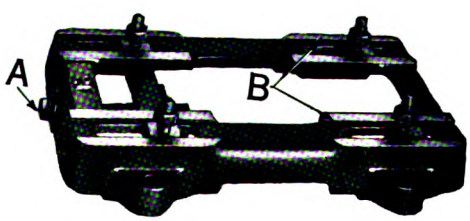
Riveted frames (A) combine strength, compactness, and low weight per horse-power. "Internal directive ventilation"—direct exposure to air of stator laminations (B), and large openings in end frames (C) combine to make a cool running motor. Special dipping and baking processes assure protection to windings. Insulation is moisture- and dust-proof—smooth, and easily cleaned.



Bars, end rings, and fan blades (see cutaway section at A) are cast as one unit—no loose joints or high resistance spots. Accurately machined shafts of selected steel and ample cross section. Fillets at all points of diameter change (B). Heavy thrust collars (C).



Extra large capacity oil wells (A). Oil rings (B) (one-piece brass) with positive protection against ring displacement. Linings (C) drawn steel with centrifugally cast hard tin babbitted bearing surfaces. Felt lined oil well covers (D), close shaft clearances and grease seals (E) and tight-fitting G-E monogram dust cap (F) combine to exclude dust and dirt.



Easily mounted on wall, floor, or ceiling. Single adjusting screw (A) permits quick change of belt tension. Heavy holding-down bolts provide rigid motor support. Milled grooving (B) assures correct drive alignment.

"KT" Motors can be furnished with ball bearings if desired.

Motorized Power
—fitted to every need

201-6

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN PRINCIPAL CITIE

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to The INDUSTRIAL MARKET

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Through INDUSTRIAL MANAGEMENT, the advertiser can reach a substantial number of executive readers in the larger plants of all industries.

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If your painting requirements do not justify the investment in an outfit, write us for the name of a Binks Spray-Painting contractor. Or write us for details, prices, and any information you may wish. Address our Engineering Department.

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Save 60% to 80% of ing Bills

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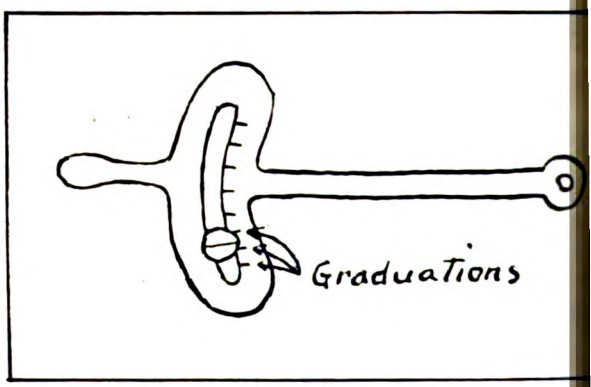
A Fuel Saving Kink

By W. F. Schaphorst

THE other day a friend of mine, who is a mechani engineer, showed me a fuel saving kink which he employing on his boiler. The idea is sketched herewi

Most boilers which are provided with damper re lators are equipped with a lever device placed in a c venient position for opening and closing the damp However, the operator has to go about it more or blindly, or by guess, and does not know from the appe ance of the handle or lever the exact amount the dam is open. Therefore it is not accurate.

This engineer carefully measured the opening of damper and made graduation marks on the lever as i



cated—each graduation representing a half-inch full inch of opening. On his boiler as I remember mark represented a full inch. Now he knows ex what's what.

He stated that since making use of these gradua he has been able to regulate the amount of air adm into the boiler much more accurately than here and he has made a substantial reduction in the am of fuel burned.

It takes only a few minutes to measure damper ings and make graduations of this kind and it is worth while.

Does Hot Water Freeze Quicker T Cold Water?

EVERY householder knows that his hot water freeze quicker than his cold water pipes. why?

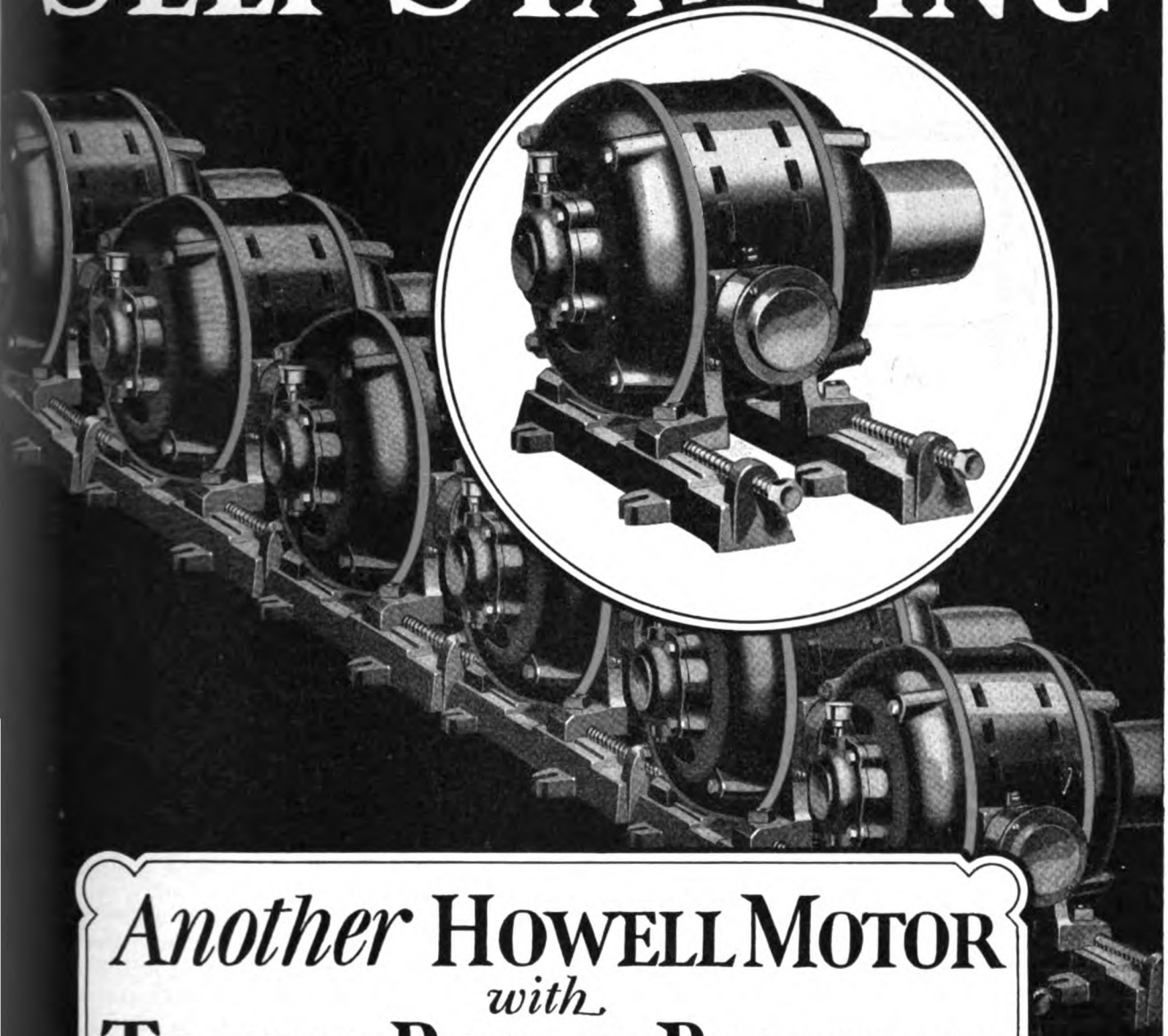
Seemingly there should be no reason as in th dinary home the hot water and cold water pipes r parallel each other and therefore both are expos the same external temperatures at all times.

The fact remains however that in zero weathe careful householder turns off his hot water an the cold water drip in the bathroom to prevent fre Others not so careful may turn on the hot water zero morning and discover that the pipes have while the cold water faucet produces a welcome s Even if the cold water pipes are frozen he know the hot water pipes congealed considerably in adv

Despite the common knowledge of this occurren

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SELF STARTING



Another HOWELL MOTOR *with* TIMKEN ROLLER BEARINGS

One of the many types of polyphase motors built by Howell and equipped with Timken Roller Bearings is the High Torque Double Squirrel Cage Induction Motor; combining high starting torque with low starting current. With this motor any approved single throw switch may be used for starting—eliminating the first cost and maintenance expense of a compensator or other current reducing starter. This motor is particularly adaptable for continuous duty load where high starting torque is required. (92)

Write for descriptive literature and prices on self-starting type squirrel cage motors.

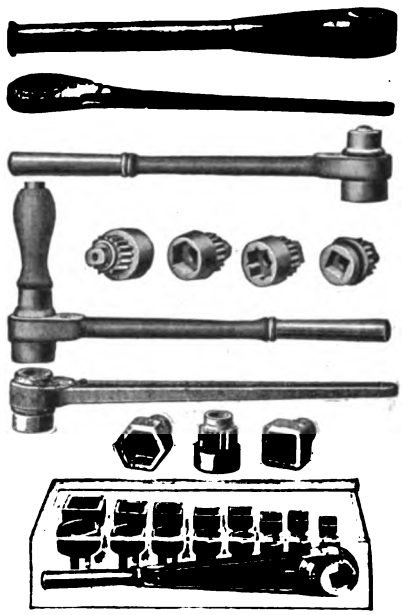
Howell RED BAND ELECTRIC Motors

Make Good On the Hard Jobs

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

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LOWELL
REVERSIBLE RATCHET
WRENCHES



All sizes for all uses both square and hexagon
Openings ½" to 5" across the flats

LOWELL WRENCH COMPANY
Worcester, Mass.
Ask Your Hardware Dealer For Them

REVOLUTIONARY IMPROVEMENTS IN POWER PAINTING

You Can Save 3/4 of Your Inside and Outside Painting Costs

with the Paintair BRUSH MACHINE and Pneu-Gun ATOMIZATION

Much better, faster work with a far greater coverage per gallon is the record being made by the Paintair Machine and Pneu-Gun. Every part of entire equipment coordinates perfectly. Greatly increased speed and efficiency is the result. No special skill is required in preparing paints for this equipment. Any one who can mix Paints for hand brushing can mix them for the Paintair Machine and Pneu-Gun.

New principles of atomization embodied in the construction of the Pneu-Gun enable it in many cases to produce an enamel-like finish with ordinary paint. The Pneu-Gun is non-clogging and self-cleaning, permitting quick changes in colors and materials. Designed and balanced like a revolver. No exposed parts to be damaged or broken. Sensitive one finger trigger material control lets operator change paint stroke instantly from one wide enough for a wall to one narrow enough for a window frame.



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America's Headquarters for Spray Finishing Equipment

MELLISH-BLEDSOE PRODUCTS HAYWARD CO.
Manufacturers 211 W. Austin Ave. Established 1894 Chicago, Illinois

Mail Coupon Today **SERVICE EVERYWHERE** **Mail Coupon Today**

527
Please send me catalog 113, and give me details on saving 75% to 90% on painting costs by power painting with the Paintair Machine and Pneu-Gun.

Name .....

Address .....

first laboratory demonstration of this seeming phenomena was given yesterday at East Pittsburgh by Leon McCulloch, research engineer of the Westinghouse Electric and Manufacturing Company. He is probably the first to give a scientific explanation of this occurrence which has heretofore seemingly violated natural laws.

Mr. McCulloch states that he first heard of this peculiar behavior of the pipes fifteen years ago, but he believed that it could not be true. Since that time the matter had been so far removed from his ordinary line of work that he had given it no thought. A few weeks ago, however, during freezing weather his own home water pipe froze and in the process of thawing it out he sought to find in his mind a reason.

He saw what appeared to be a possible explanation so he determined to set up laboratory apparatus to find out whether or not his explanation would stand the test of experiment. After two weeks of intermittent work he convinced both himself and other workers that his theory could account for the more rapid freezing of the warm pipes.

His new explanation is based upon the well-known fact that water is densest or heaviest a few degrees above freezing. On either side of this temperature which is 39 degrees F., the water is lighter. For example, at 44 degrees F. one quart of water weighs 946 grams, at 39 degrees F. it weighs 946 grams, while one quart of ice weighs only 887 grams.

A statement by Mr. McCulloch concerning his experimenting follows:

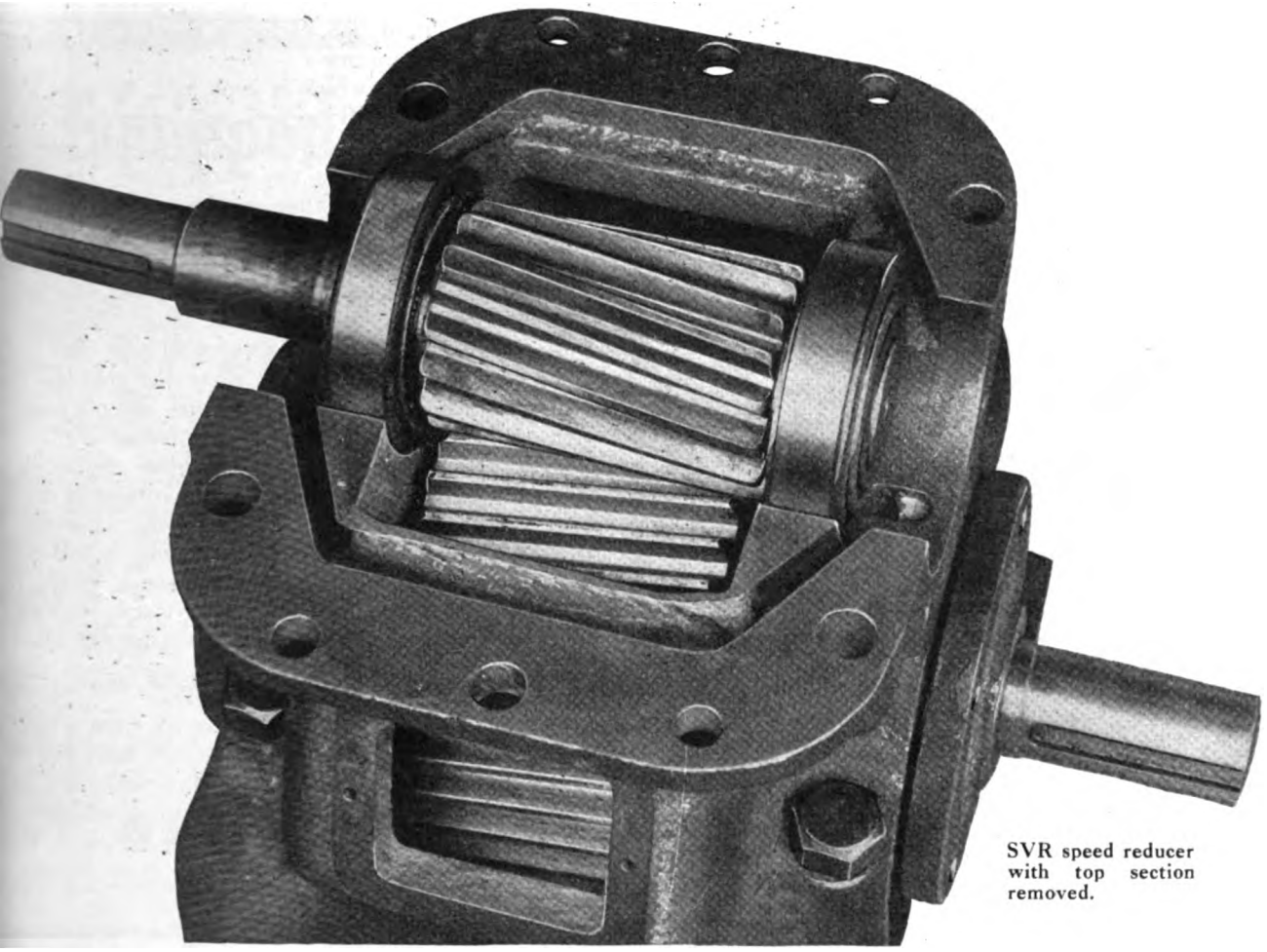
"Thus water changes in weight only about one part in 1,000 when its temperature drops from 39 to 32 degrees F., but water is such a mobile fluid that this small decrease in density is enough to set up a circulation or convection when the lighter 32-degrees water is at the bottom of a vessel and the heavier 39-degree water at the top. If we have a tube or pipe containing water at its greatest density, 39 degrees F. we can set up a circulation and change the temperature of all the water in the tube whether we apply heat to the bottom of the tube or whether we cool the bottom. For whether we heat or cool, we cause the bottom layers of the liquid to become lighter and to rise while the denser layer fall to the bottom where they in turn become either heated or cooled, as the case may be.

"Suppose we take a closed pipe filled with water and cool the lower end very slowly to the freezing temperature. As the water cools toward 39 degrees it becomes denser and no circulation takes place until we cool below the 39-degree point. But when the water falls below this temperature it commences to become lighter than the layer of water at 39 degrees which lies above it. This denser 39-degree water therefore starts to fall and the colder but lighter water rises out of the way. Thus a circulation is set up as the point of freezing is approached. This circulation, however, does not extend all the way up the tube but takes place only below the point in the pipe where the water is densest, which is where the temperature is about 39 degrees F.

"Above this point in the pipe the water remains warm and since it is lighter than the colder water below it takes no part in the circulation.

"Since the circulation extends from the point of freezing temperature to the 39-degrees point in the pipe, the amount of water kept in circulation depends

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SVR speed reducer with top section removed.

NUTTALL HELICAL GEAR SPEED REDUCER WITH TIMKEN TAPERED ROLLER BEARINGS

THESE helical gear speed reducers are simply and ruggedly built. They have but few parts to wear and get out of order,—they are built to operate continuously, with no attention beyond occasional lubrication.

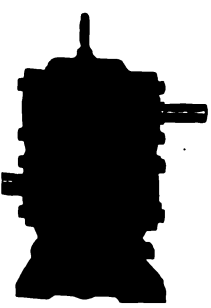
Single helical gears give a smooth, vibrationless operation, with high mechanical efficiency. They have great tooth strength, and they have wearing qualities superior to any other type of gearing. One of the outstanding characteristics of helical gears is their ability to resist external thrust.

Helical gears in Nuttall speed reducers are hobbed from forged steel blanks, and they are heat treated and hardened to give them additional strength and wear life.

Timken bearings; the sturdy, three section case; and the Nuttall system of positive splash lubrication are other features which make Nutall speed reducers superior to other types.

Nuttall speed reducers are available up to 150 h.p. and ratios of 8:1 in single reductions, and 200 h.p. and ratios of 30:1 in double reductions.

Send for our Speed Reducer Bulletin.



SVR. single reduction speed reducers up to 150 hp., 8:1 ratio.

R. D. NUTTALL CO., Pittsburgh, Penna.

Philadelphia—Chicago—Wilkes Barre—Houston—Los Angeles—Salt Lake City—Canada—Lyman Tube & Supply Company, Montreal, Toronto.

Nuttall Helical Gears

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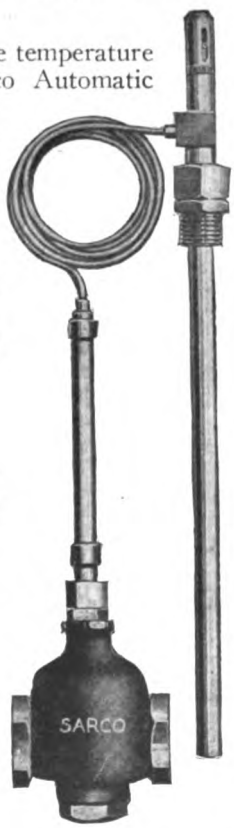
How Do You Maintain Temperature?

Do you use the old-time method of guessing at temperatures, or are you using a thermometer and adjusting valves by hand? Then your products are not uniform and they are being subjected to damage and loss.

Guessing is gambling. It is costly and wastes time of employees.

Modern plants are solving the temperature regulation problem with Sarco Automatic Temperature Regulators. Set a Sarco to any definite temperature between 30° and 300° F.—and forget it. Works on steam, gas or hot water.

Is entirely self-contained. Requires no outside attachments or operating medium, such as electricity, compressed air or water pressure.



30-Day Free Trial

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Booklet R-96 sent on request.

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TEMPERATURE REGULATOR

advertised in this issue write Industry Illustrated

upon the height of the 39-degree point above the pla of freezing temperature.

"Now in a pipe, which is kept cold, the point whe the temperature is 30 degrees will naturally be fou much higher up, farther from the point of freezing, th will the similar point in the warm pipe. The amou of water kept in circulation in the cold pipe will th be much greater than the amount that circulates in t warm pipe. The circulation in both pipes tends to ke the water at the bottom from freezing since the colde water rises and the warmer water falls. Since there more water in circulation in the cold pipe than in t warm it is more difficult to freeze the cold pipe th it is the warm one and the cold pipe will not freeze soon as the warm one. It may not freeze at all.

"The actual water pipes in a house are not clos at the lower end of course, but the conditions may such that it amounts to the same thing. For there often a horizontal stretch or pipe, along a cold ceili for example, just before the pipes pass a freezing co space through a floor into a slightly warm room abo The horizontal pipe prevents convection and thus h the same effect practically as if the pipes were plugg at the bottom of the vertical portions.

"When a hot and cold pipe pass up from a freezi region into a slightly warm room, the cold pipe m remain at about the 39-degree point, while the wa pipe, if slightly protected, may remain at a higher te perature long enough for the exposed portion to free solid. The cold water will be kept from freezing the circulation."

Protection Against Breaking Belts

By Donald A. Hampson

FROM our Physics, if we remember it, we learn that the force of a blow increases as the square the velocity of the hammer or other object that does striking. Applied to a particular case, that of a b that breaks while running, we would learn that a b traveling at 100 feet per minute delivers a blow fo times as great as one traveling half that speed, or f.p.m., assuming that each broke under the same co ditions—this ratio being that of the square of 100 to square of 50.

The illustration shows a simple but effective meth adopted in one plant to guard against an accident fr their fastest heavy belt should it break. This is a 4- double belt of the heaviest weight (32 oz. per squ foot) and it travels at a speed of 5400 f.p.m. It so h pens that the machine it drives has an open work space directly behind this vertical belt. At this speed belt breaking as it mounted the pulley would lash out a giant whip and strike down any person who mi be in its path.

A far seeing management caused to be erected the p tection seen immediately back of the pulley. It is me a length of hard pine an inch thick and as wide as pulley on which the belt runs. Fastened to the be overhead and to a part of the machine frame just be the pulley, it is an effective guard against possible a dent.

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Equipped with Willson-Weld Glass

Willson welding helmets, welding goggles and the handshield are now regularly equipped with Willson-Weld Glass—the welding glass that is over 99% protective. Here are two pieces of equipment which are winning welders to modern protection.



Willson Welding Helmet No. 200
with Willson-Weld Glass. $12.60 each



Willson Welding Handshield No. 1
With Willson-Weld Glass. $7.50 each

Prices are f. o. b. Reading, Pa.

WILLSON GOGGLES, INC., READING, PA.

Largest factory in the world manufacturing goggles, welding helmets, handshields and respirators.



Your Final Choice will be VICTOR

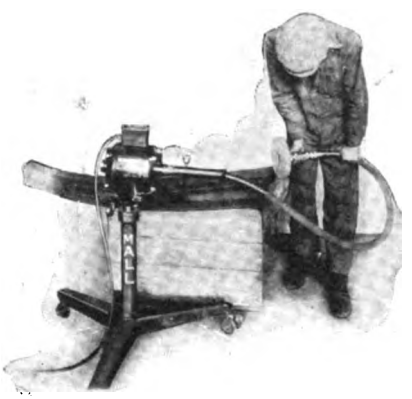
Every day there are more concerns coming to the Victor blade after trying other, inferior blades which were represented to them as "just as good a blade."

The more cutting you do, the more opportunity you have to see the difference in hack saw blades.

Why waste money experimenting when your final choice will be Victor?

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

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Type D4—1 HP Mall Portable Grinder

Electric Flexible-shaft grinding machine using an 8" diameter x 1" wide rubber bond combination disc and edge grinding wheel operating at 3450 R.P.M. to finish steel castings.

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Makers of the largest assortment of flexible shaft machines and attachments in the World. Shipments made on approval.

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Machine Shops
use them. EVIDENCE!

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"The Tool Holder People"
318 N. Francisco Avenue
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Parks shipping room saw
at a lower price!

was $75.00
NOW $60.00
without motor



Cut your crating pay-roll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

FILL OUT AND MAIL THIS COUPON—NOW.

I. I.
The Parks Wood-Working Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.

You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.

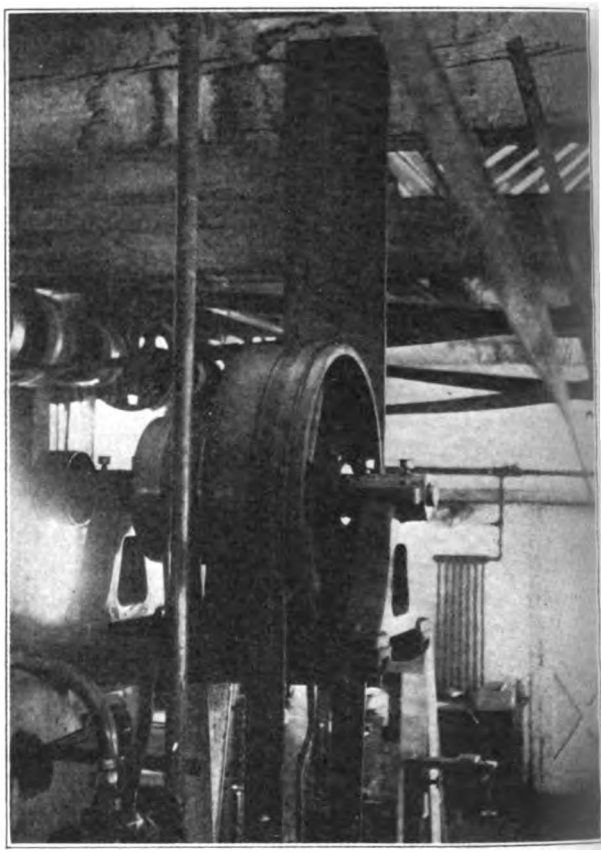
Name .....
Firm Name .....
Address .....
City ..... *State* .....

The Parks Woodworking Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

Accidents from belts breaking are common. Fortunately, most of them occur where the speed is low or no one is in line with the outflung end. But a belt that strikes a person is apt to inflict more or less serious injury—an injury that may range from a badly bruised wrist to a fatality.



Completely enclosed belts are the safest protection fro this hazard but they are seldom feasible and often sh off a good deal of light. Belts like the one illustrate which are shifted continually while running at a hi rate of speed, are more apt to break than those less s verely stressed; the protection shown is simple, effecti and inexpensive. The wide use of metal fastenin adds a further sting to injuries from the broken en striking workmen.

Guarding of belts of large size can often be made production factor in the plant. It takes away the fe which men have, saves damage to property, and it creases working space. Main driving belts may of be enclosed in such a way that space otherwise was may be released for storage or a passageway may sa be opened up which wasn't possible before because low head room in connection with the moving belt space, as illustrated, is made safe for general floor p poses.

Cheap Power for Concret Mixer

By L. M. Jordan

THE accompanying illustration shows the arran ment of an automobile motor to be used a power plant for propelling a portable concrete mix The body was removed from the chassis and the

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Get a "C-M" Idea!

IF the transportation of material in your plant is left to the physical ability of men to lift and carry, your costs are higher than they need be.

In the plant illustrated in the view above, *ONE* man with a "C-M" Electric Hoist and Traveling Crane moves more material with less effort than *FOUR or MORE* men could possibly do by physical effort.

Moving should not be 90% of Making!

Results

ONE MAN doing the work of FOUR or MORE, thereby releasing three or more men for other work! Faster handling of material; Rock bottom handling costs; And valuable floor space saved because of the ability of the "C-M" equipment to stack material higher than could be done by the combined strength of a gang of men.

Put "C-M" Ideas to work in your plant!

CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS



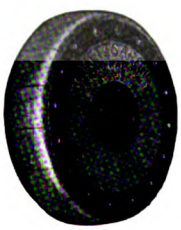
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"METZGAR"

END-WOOD WHEELS

Keep Production "Up" and Floor Repairs "Down"



Regular Duty with Oilless End-Wood Bearing



Heavy Duty with Hyatt Roller Bearing

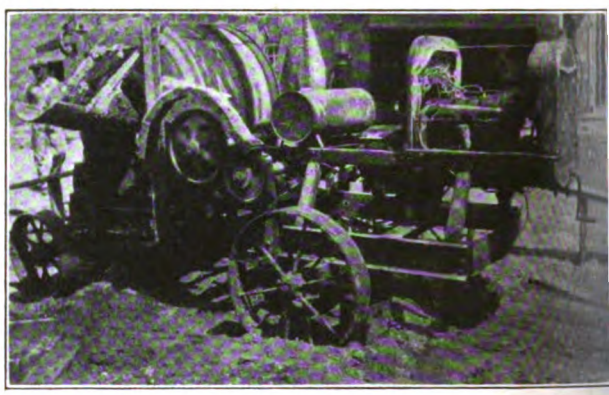


Type of Wheel Supplied for Casters

Send for booklet, prices, new discounts!

METZGAR CO., Inc.
459-503 Grandville Ave.
Grand Rapids, Michigan, U. S. A.

rails of the chassis were cut off back of the front sea position. The drive shaft was also shortened by cutting out a section, bringing the rear axle near the universa joint and just under the side members of the chassi frame as shown. The rear wheels were removed an displaced by an 8-inch gear wheel which meshes with 10-inch gear on a short shaft running across the to of the chassis frame. At the center of this shaf a 4-inch gear is mounted and meshes with th teeth around the mixer drum to revolve it. The moto remains mounted in the front end of the chassis which is mounted on top of the mixer framing b using short pieces of side members of a chassis fram as legs or posts. The two gears transmitting the powe to the drum have a shield or fender curved above them t prevent grit or gravel dropping on the teeth. The rea axle is supported by U-bolts passing around it and u through the side members of the chassis.

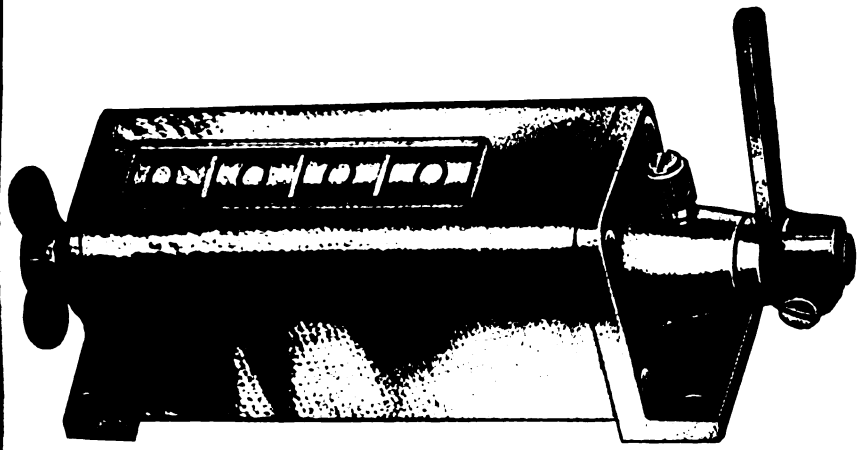


With this motor the speed of the mixer is readi increased or decreased by adjusting the carburetor if accelerating a car, and when necessary to stop t mixer it is only necessary to pull up the emergen brake lever disengaging the clutch and letting the mot idle. To start it, the low gear pedal is depressed, sta ing the drum.

Record of Industrial Accidents in t United States to 1925

THE latest statistics of industrial accidents on a t tional scale have been brought together as far possible by the United States Bureau of Labor Statist and are presented in its Bulletin No. 425, recently p lished. This, the fourth bulletin on the subject by bureau, brings the data up to 1925. The three Fede agencies collecting accident statistics, the Interstate Co merce Commission, the Bureau of Mines, and the Bur of Labor Statistics, have so improved their methods collecting and handling accident data that their statis on railways, mining, and the iron and steel industry, spectively, while naturally not entirely complete, r fairly be claimed to be trustworthy. While the st have collected a mass of statistics, unfortunately t have adopted different procedures, which makes it d cult to combine their records into a national compilat The Bureau of Labor Statistics, in its effort to prom accident prevention, has suggested five items that essential in effective accident statistics: Exposure to l ard; number of accidents; severity of accidents; cla fication by industries; and causes of accidents. No s covers all these items and in most states no attemp

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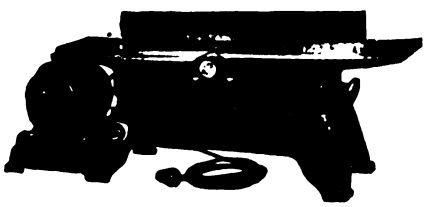
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Set-Back Counter

Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

MEN you can *count on* to get out the work are men whose work is counted on "VEEDERS." Because those men are more responsible for showing a definitely *high* production. Their work is recorded, their time is accounted for; their value is plainly registered on their Counters. If you're short of workmen you can *depend* on, the Veeder booklet will help—and you can depend on *that!*

THE VEEDER MFG. CO., 31 Sargeant Street HARTFORD, CONN.



Take This Jointer Right to the Material and Cut Costs

BY ADOPTING the H & A Portable Electric Bench Jointer, you will cut down labor and save trucking of material. This machine, which will dress down the roughest lumber so smooth that it needs no sanding, can be moved quickly right to the material—or from job to job in the busy plant. It works with absolute accuracy and can be used for the finest cabinet and pattern jobs.

All electric bench machines in the H & A line, consisting of this jointer, the band saw, rip saw, swing saw and lathe, are sturdily built with plenty of power. Each is a self-contained unit, easily moved, and takes up small floor space.

Write us for more details about this line of woodworking machinery which sells through dealers.

HESTON & ANDERSON

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H & A Bench Machines



Cheap Window Cleaning

It Costs Less Than One Cent a Square Foot to Clean Windows with Sunburst Paste

FIVE pounds of Sunburst Paste will clean 500 to 800 square feet of dirty window pane. Put Sunburst on—rub the dirt and grime off—save labor. Sunburst gives windows a high, lasting gloss—they look cleaner and stay clean longer. Sunburst is safe—no acid to injure workman or damage tools or machines. Water is unnecessary—no slopping. Order a barrel, ½ barrel or ¼ barrel of Sunburst Paste—if it doesn't satisfy you perfectly we will cancel your invoice.

LIQUID CLEANERS TOO

We also manufacture liquid window cleaners as well as Thesco Organic Cleaners, Soft-as-Silk Liquid Soap, Hexstercide Insect Killer, Hykotar Disinfectant—everything in Industrial Sanitation.

THE GERSON STEWART CORPORATION

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Sunburst

WINDOW CLEANING PASTE

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Cast Aluminum Wheels on

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Man Cooling

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There is as much difference between ROBINSON MAN COOLING FANS and other makes as there is between one machine and another of the same type.

ROBINSON FANS are equipped with cast aluminum wheels which give

20% *More Air at Same Speed With Less Power*

These aluminum wheels require less power than any other propeller type wheel on the market. You will appreciate this if you believe in the utmost in fan efficiency at the lowest cost.

Write for descriptive literature and list of users

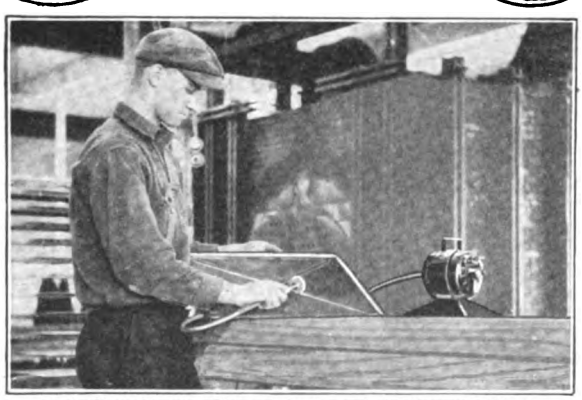
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TURBINE & CONIFLO FANS

Save These For Work a Machine Can't Do



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Porcelain Enameling Plants Also Make Profitable Use of Haskins Equipments.

There are numerous opportunities to reduce the cost of manufacture where it is necessary to remove defects in porcelain enamel ware which do not show up until after the burning. Small grinding wheels remove the rough spots which must next be retouched with enamel and then rubbed out by hand before they can be reburned.

Ask your jobber and write for Special Bulletin covering this or tell us what you do and we will send the literature you should have.

R. G. HASKINS CO.

Portable Flexible Shaft Machinery

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made to cover the very important item of exposure to hazard. Some states make no accident reports.

As reported by the states there were 10,537 fatal accidents and 1,687,957 non-fatal accidents in 1925, as compared with 11,479 fatal and 1,666,522 nonfatal accidents in 1924, and 11,062 fatal and 1,636,837 nonfatal accidents in 1920. An effort was made to classify the available state data for 1920 and 1924 by principal classification groups. As some of the important industrial states do not classify their data by industry the comparison by industry was inconclusive. As to causes of accidents the handling of tools and objects gave rise to the greatest number of accidents, there being 472,805 cases out of 1,552,065 accidents in the two periods, machinery coming next with a total of 294,951. Bruises and cuts, lacerations, and punctures led all the other groups in the nature of injury. As to location of injury the upper extremities were found to be the most often damaged, there being a total of 333,195 cases out of 801,633 accidents.

In its endeavor to encourage the development of accident rates the bureau has recently sought to utilize the data contained in the state accident reports in obtaining accident rates by relating such data to the employment data collected directly by the bureau. Ohio, Illinois, and Minnesota were the only states for which information was available for 1924 and 1925.

In 12 industries there was a decline in accident frequency from 1924 to 1925, the greatest being in the following industries: Automobiles (58 per cent.); agricultural implements, and electrical machinery (each 49 per cent.); and planning mills (46 per cent.). In 6 industries there was a rising frequency rate, the greatest increase being in the boot and shoe industry (150 per cent.), followed by those in the stove industry (56 per cent.) and in the flour industry (42 per cent.).

In accident severity also there was a decline in 12 industries, electrical machinery (73 per cent.), glass and stoves (each 59 per cent.), and machine tools (52 per cent.), having the greatest decline, while in 6 industries accident severity increased, the greatest increase being in structural-iron work (97 per cent.), flour (81 per cent.), and agricultural implements (74 per cent.).

Data for 1925 was gathered from 11 states and represented 1,272 plants in 24 industries, employing 555,98 full-year workers, sufficient to make the accident rate therefrom a fairly dependable index of average conditions. The highest frequency rates were for the automobile tire industry (59.08) and structural-iron work (50.95). The highest severity rates were for paper and pulp (4.85) and structural-iron work (4.54).

The Bureau of Labor Statistics has been collecting accident statistics of the iron and steel industry since 1910 and has constantly endeavored so to present these statistics as to make them significant and useful in accident prevention. These statistics show that there has been a steady decline both in accident frequency and severity in the industry. From 1910 to 1925 the decline in frequency was 62.1 per cent. and in severity 51.9 per cent. This steady and quite considerable decline is also shown in all departments with the exception of foundries. Considered from the standpoint of accident severity machinery causes the greatest amount of damage, while handling of tools and material is the major factor in the frequency of accidents.

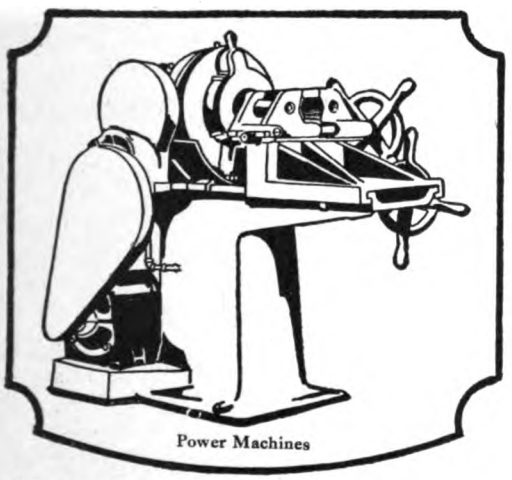
Accident data for the following industries gathered from various sources are also presented in the bulletin

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SETTING the pace is a stiff job but Oster has that habit. For thirty-three years Oster has been working toward new and better types of pipe-threading equipment. The past three years have been particularly productive. Have you looked into a recent Oster catalog? Send for one.

OSTER



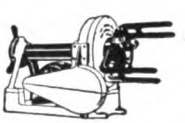
Power Machines

Because of its versatility and adaptability to nearly all kinds of threading work, the Oster Power Machine, is recognized by plant superintendents everywhere, as the ideal, general purpose, pipe machine for factory maintenance.

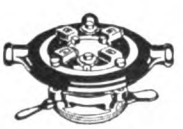
Write for full details and prices and a copy of the latest Oster Catalog, showing the most complete line of pipe tools and machines in the world—manufactured by The Oster Manufacturing Company, 2058 East 61st Place, Cleveland, Ohio.



Bull-Dog Die-Stocks



The Power-Boy
"Motorize Your Stocks and Dies"



Receders

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These things, to you, mean economy in hollow screws; not "price" economy but *operating* economy. Yet asking for "Allens" doesn't insure it.

Since the trade-name "ALLEN" has come to cover *all* hollow screws (in some minds), you are apt to get the Allen *type* but not the Allen *make*.

You can get real "Allens," Allen-made, from most all leading Jobbers. If you'd like the names of the most convenient, we'll gladly send you the list for your locality.

The Allen Mfg. Co.

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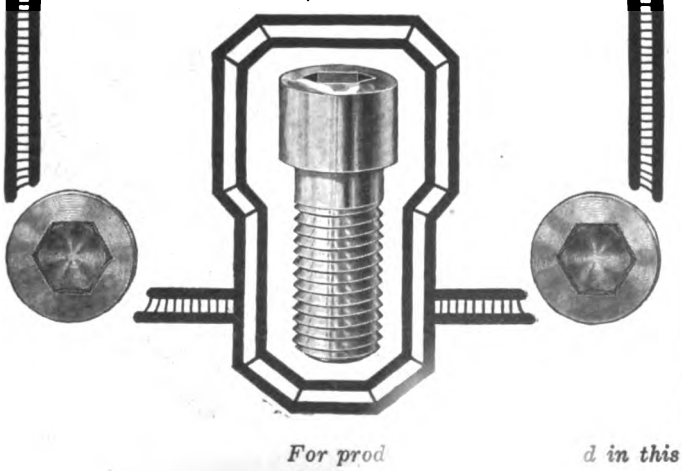
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Steam railways; electric railways; mines, quarries and metallurgical works; agricultural implements and supplies; building construction; explosives, dyes, and chemicals; light and power; camera manufacture; Portland cement; paper mills; petroleum refining; rubber; wood working and textiles.

Accident frequency rates in the various department of the Federal Government and the National Safety Council compilation of American industrial accident experience in 1925 are also shown.

Atonic Energy

By S. W. Fredericks

CERTAIN scientists have been telling us for a number of months about the tremendous energy locked up in every atom. They tell us that if we could but unleash that energy and then put it to work the energy problem would be solved forever. We would be amply supplied with light, heat, and power, for all time, all of which sounds very good indeed.

Probably there is an untold amount of energy in atoms but how are our scientific friends going to get it out? First there is the problem of releasing the energy and then comes the problem of harnessing it. How will scientists do either?

As things now stand we cannot utilize 100 per cent of the energy in coal, oil, and potential water power—energy that is virtually handed to us on a platter. Fifty per cent. is about the maximum accomplishment with converting heat into work. That being the case does the utilization of atomic energy look like a hopeless task? Nature has never yet given us something for nothing and it isn't likely that she ever will.

My prediction is this: If a method of releasing and harnessing atomic energy is ever discovered, more energy will be required to do the releasing and harnessing than is contained in the original atom. It will be like trying to connect an electric generator and motor in such a way that each will drive the other and at the same time produce a surplus of power. No such precedent has been established. Engineers decided long ago that perpetual motion is impossible.

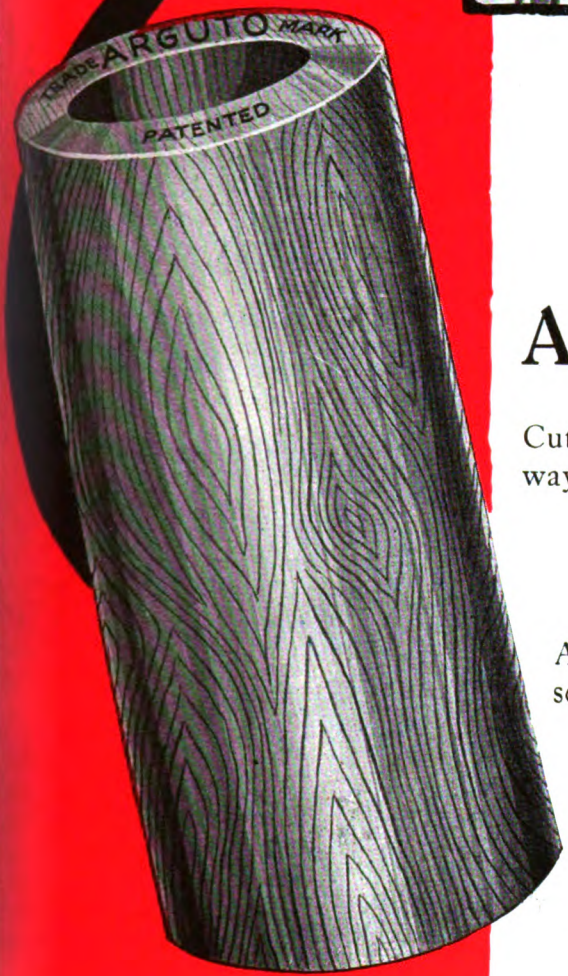
New Applications of Portable Machinery for Handling Excavated Material

THE use of portable truck loaders for excavation work is common practice among contractors and receives only passing notice. It is one of the qualities of such equipment, however, that it has other uses than the work for which it was specically purchased. So with the large truck loaders. Their particular work is general handling quantities of stone and gravel in addition to excavating for cellars, foundations and similar rough work.

The N. P. Nelson Iron Works of Passaic, N. J., have used this machine for grading the site of a new building. The loader in question is mounted on crawler treads and is carried by a gasoline tractor which supplies the power

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DART Unions with the Bronze-to-Bronze seating surfaces stay tight, they cannot leak—they cannot rust—they cannot corrode.

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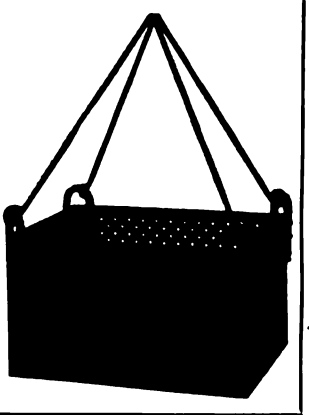
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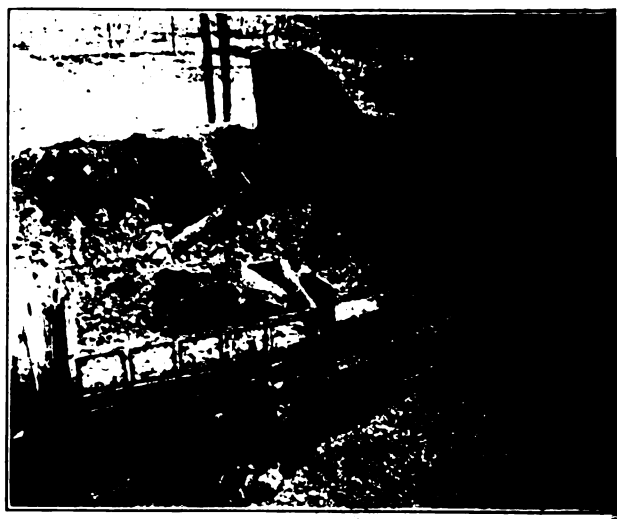
See Data A. S. M. E. Condensed Catalogue ... Mechanical Equipment, also Chemical Engineer ... dricks, Sweets Engineering, and T... ...ues.

for operating the bucket elevator. A spiral feeder with a serrated periphery draws the material to the path of the elevator buckets. The latter discharge through a chute which forms a pile on the ground. A number of piles are made in rows by the alternating travel of the



loader over the ground. Afterwards these piles are transferred to trucks for disposal.

The regulation of the feeding device in relation to the ground is such that without the use of other equipment the site was graded to within 2 inches of finished grade by one man and the loader.



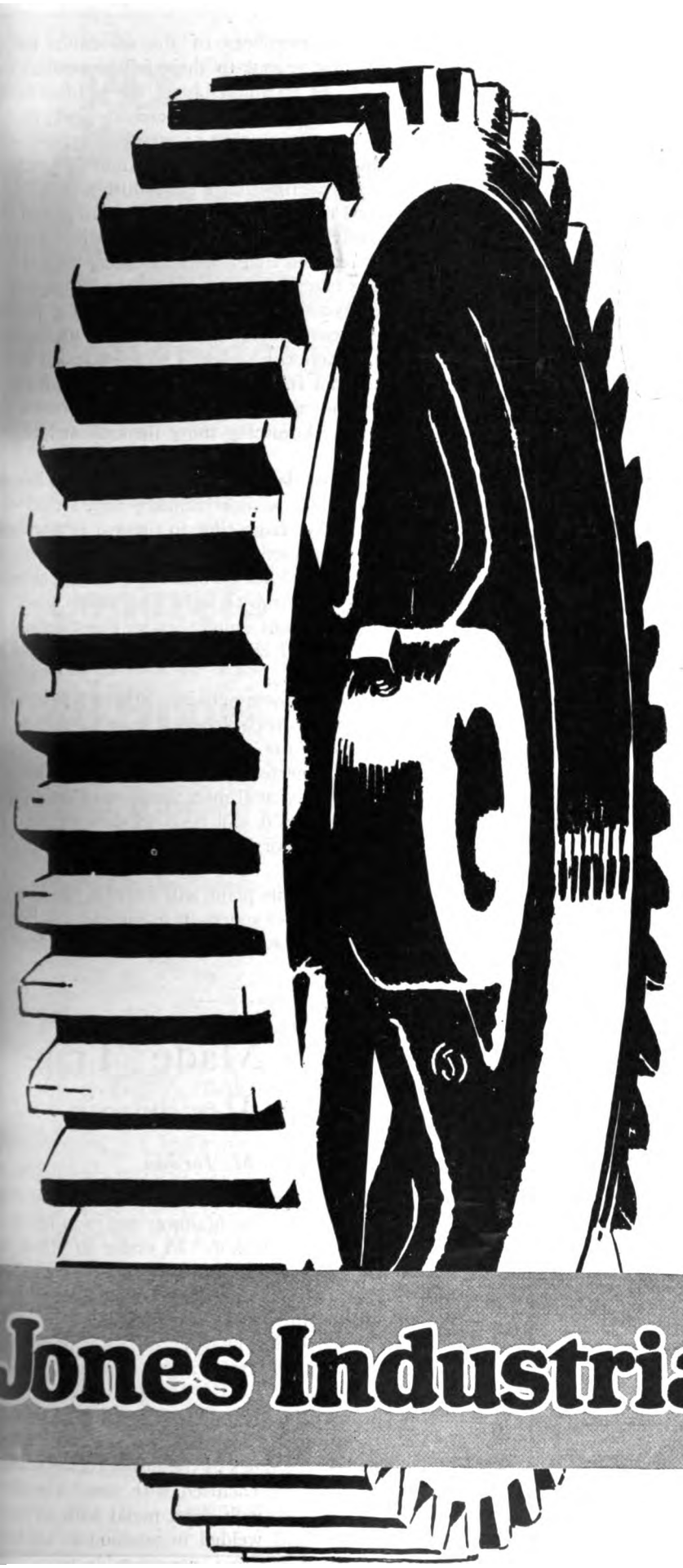
The Institute of Dyeing and Cleaning

THE National Association of Dyers and Cleaners at their annual convention in January, 1926, voted unanimously to establish an Institute of Dyeing and Cleaning. Since that time, the members have been subscribing to shares of preferred stock, that being the plan adopted for raising the necessary funds. The money is to be used in buying land in Washington, D. C., erecting a building and furnishing it, together with the necessary equipment usually installed in a dyeing and cleaning plant.

For a few years, the association has been conducting research at the Bureau of Standards by an expert research associate. Notwithstanding the limitations of this arrangement, it proved very useful in various ways, and especially valuable in showing the members what might be accomplished by the institute it was proposed to found in the near future. The plan of the institute was under discussion for about five years, and it finally was decided

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You can get spur, worm, bevel or mitre gears in cut steel or cast-iron—also rawhide and bakelite pinions.

The most up-to-date equipment insures gears that are accurately made and promptly delivered.

Send your specifications to the home office or the branch sales and engineering office near you. We will gladly submit prices. If you haven't a copy, write for Catalogue Number 30.

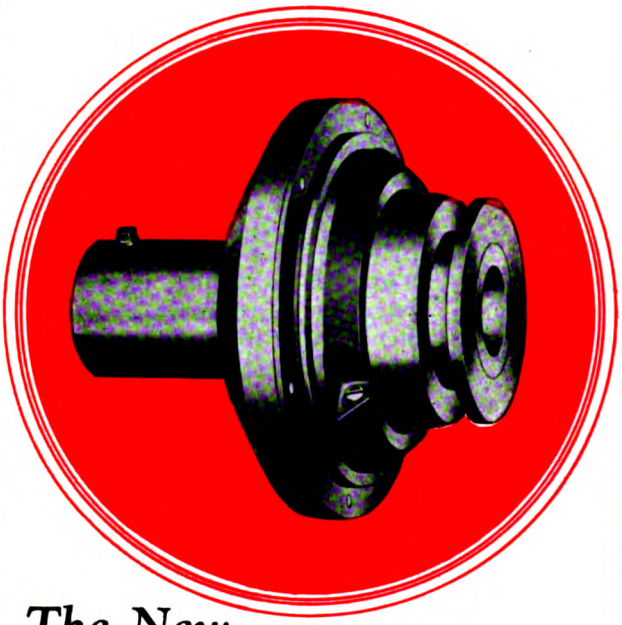
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DISC CLUTCH

After many years of experimentation and tests, we have brought out the Conway Disc Clutch that has the following salient features:

1. The Clutch presents only a finished cylindrical contour.
2. There are no flying bolts, toggles, levers or pins.
3. The actuating parts are completely enclosed, yet the adjustment is handy and plentiful and clamps tight, being a simple split ring with a smooth finished surface.
4. The levers are alloy steel with a large factor of overstrength. Their under-slung position permits a large lever ratio which requires only slight pressure for engagement.
5. Centrifugal force would disengage the clutch when the cone is withdrawn, even if there were not springs forcing the plates apart. Vibration cannot cause the cone to withdraw, as this part is machined with a proper deflection angle.
6. A unique process of treating the key surfaces has practically eliminated wear in the splines.
7. The clutch is probably the quickest and easiest disassembled unit of its kind produced.
8. All discs are treated steel with woven asbestos lining, with ground faces as standard production.
9. The body of the clutch is counterbored to permit the pulley hub to extend under the point of frictional driving contact, which also saves considerable shaft space.
10. The clutch is inherently balanced.

We are ready to send descriptive matter and complete information.

THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio

that the sum of $125,000 would be required to carry it out.

The progressive members of the association busied themselves in pointing out to their fellow members the great possibilities of accomplishment where ample facilities could be made available for research work, but of even greater importance is that of establishing more completely and thoroughly the standardization of processes in the different departments of the industry.

It is proposed to make the institute the center of the association's activities, both executive and instructional. It is now fully realized that notwithstanding the fact that the industry has taken its place among the leading industries, the business of dyeing and dry cleaning for the general public lacks proper standardization of methods, processes, and practices; and this situation exists in the face of the fact that from the production end, it is essentially strictly technical in its nature. Furthermore, the business is steadily becoming more intricate and difficult for two reasons:

First—because of larger and more varied kinds of things that the public wishes handled, and, second—the putting on the market from time to time of new artificial fabrics and the introduction of new dyes.

Beside research work by several experts, it is included in the plan of the institute to have a school in which intensive training for plant employees in every activity in the modern dyeing and cleaning establishment would be furnished.

In connection with these activities, there will be a department in the institute which will take in work to be dyed or cleaned for the people of the District of Columbia, and it is expected this department can be conducted in a manner that will meet the cost of maintaining it. Beside this service, it will take on difficult pieces of work accepted after correspondence with the member who offers it.

Last, but not least, this plant will furnish facilities for the use of the research experts in a commercial, instead of a laboratory scale, in making experimental tests of fabrics.

A Home Made Trap-Water Reservoir

By L. M. Jordan

THE waste water that escapes from steam water-traps is very valuable in maintaining steam in boilers when conserved and used while hot. In order to utilize this water, it is necessary to provide a reservoir for holding this water until enough of it accumulates to be taken into a boiler by the injector. The accompanying photograph shows an efficient iron reservoir or tank provided for this purpose, made from an old discarded steel boiler.

The boiler was of the return-flue, horizontal type without firebox, or stationary type. The flues were all removed from it, and the holes in the heads formerly occupied by these flues were enclosed with small iron discs cut out of a piece of ¼ inch sheet metal with an acetylene welding torch, and welded in position in the heads by the torch. By doing this, considerable more sp

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FIX IT QUICK *with* Quickfix

Concrete Floor Patcher



Patches Holes in Concrete Floors in 48 Hours

Eliminates danger of employees injured, material damaged, operation impeded.

Floors Patched *Saturday*, Ready to Use *Monday*

QUICKFIX makes a concrete patch of flint-like hardness in only 48 hours. Ordinary concrete patches block traffic and delay production for ten to twenty days while they harden. With *QUICKFIX* you can *patch the floor Saturday and open it up to traffic Monday.* No costly delays or interference with plant's operation. Use *QUICKFIX* and eliminate the danger spots in your floors quickly.

Any handy man can use it. Send for our *QUICKFIX Booklet* with full details—order a barrel today.

The Master Builders Company
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Gentlemen: Send us complete information about Quickfix—for making permanent wearproof concrete patches in 48 hours. We have_____ Sq. Ft. to repair.

Name _____

Address _____

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The load stays put

The truck cannot tip over because of the knuckled joints which keep the front wheels always under the load, and the wide frame that tends to cradle the load on the platform.
They are making enormous savings in the largest plants, and their 14 exclusive features will do the same for you.

Hyatt Roller Bearings make them free rolling and increase their capacity.

Write for a catalog.

C. A. GRAHAM

National Distributor

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ESTABLISHED 1912

PLIMPTRUCK

B.E SCRIVEN PATENTS

STABLE AS THE PYRAMIDS

The LIFT TRUCK with the Knuckled Steering Wheels

40¢ a year prevented this belt slipping

This slack 10-inch belt has been Cling-Surface treated for 10 years at a total cost of but $4. It has delivered 40 h.p. constantly *without slipping*. There has been no "burning-up" of bearings or belts—no straining of shafts or machines—no delay of production because of belt break-down.

This belt when new cost approximately $150. Cling-Surface has nourished and preserved it so that, after 10 years of hard service, it is in perfect condition and could not be replaced for less than $250 to $300.

Prove Cling-Surface in your own plant. Prove it by 60 days' trial or no pay—order on trial 1 gal. (at $3.50), 3 gals. (at $3.40 per gal.), or 6 gals. (at $3.25 per gal.). Clip this ad as a reminder to write Cling-Surface Co., 1056 Niagara St., Buffalo, N.Y.

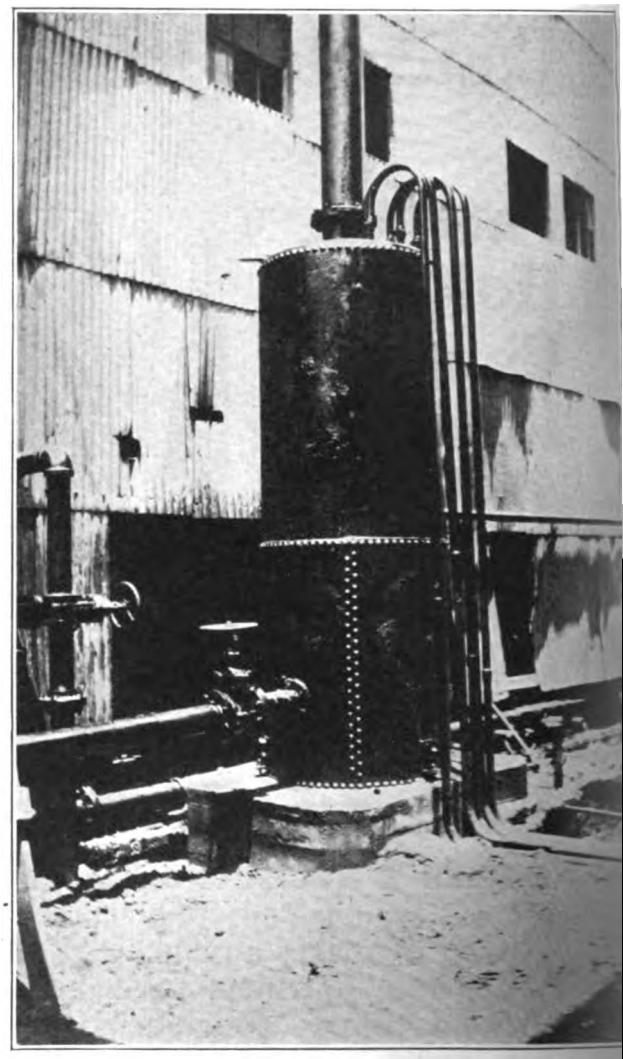
Cling~Surface

The Scientific Belt Treatment



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was provided within the boiler's hull, making it contain several gallons more water. A 6-inch diameter circular hole was cut with the torch in the center of the head formerly at the rear of the boiler, and holes were drilled around it to accommodate the bolts that were used to couple a flanged 6-inch pipe union. At one side of the same head five 1¼-inch holes were drilled near each other, and tapped, and a 4-inch long nipple screwed into each hole. A concrete base was then built in the earth beside the boiler rooms on which the old boiler was mounted in an upright position, the smokestack extension being removed also from the front end of the boiler on which it now rests on the concrete base.



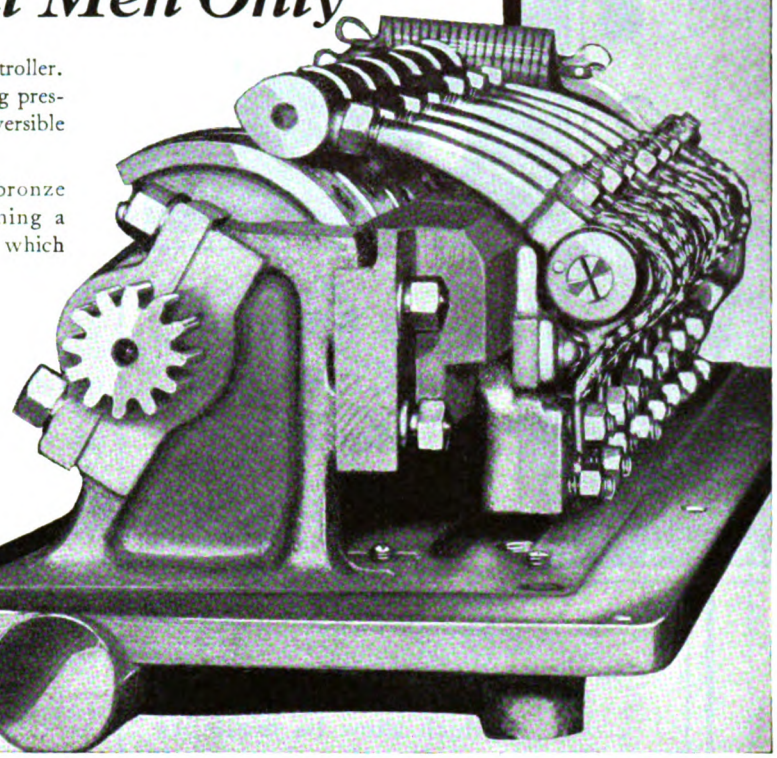
There were five traps whose waste water it was sired to pool in this reservoir. A 1¼-inch pipe line connected with the discharge of each trap and run alo the surface of the earth several hundred feet to the s of this reservoir, five in number. On arriving at the b of the reservoir these five lines were turned at ri angles, vertically upward, beside the reservoir and p its upper end, where they make a U or reverse tu Each pipe is connected with a nipple attached to the boi head by means of a universal union. A 6-inch pipe l was erected upright on the reservoir and attached its upper head by means of a flange pipe coupling a the usual bolts or rather bolts to screw into the h drilled and tapped around the 6-inch entrance, draw the flange down tightly. This serves as a vent pipe the reservoir, and extends up past the eaves of the boi

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An Advertisement for Technical Men Only

EXAMINE the fingers on a Baker controller. Their larger cross section and firm spring pressure reduce burning. The renewable and reversible tips cut down renewal expense.

Square steel shaft, Bakelite insulation, bronze spider, heavy forged copper segments forming a complete metal drum, are additional features which give Baker industrial tractors and trucks the longest life of any comparable equipment.



THE BAKER-RAULANG CO.
2179 West 25th Street Cleveland, Ohio

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.
Baker



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.
180 Autumn St. Passaic, N. J.

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

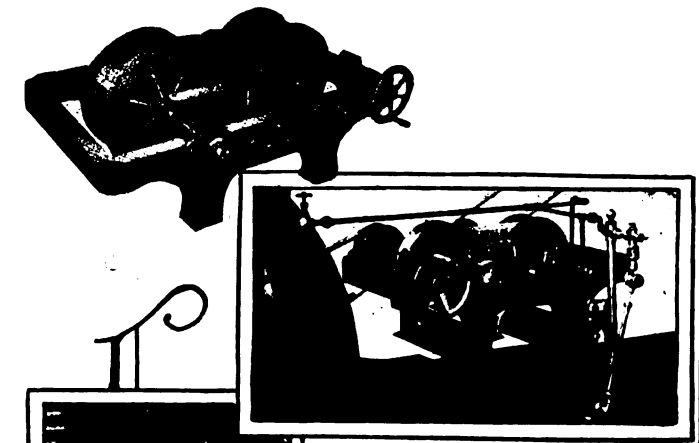
Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

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CANTON, OHIO
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Wherever varying speeds are necessary—and changed speeds must be controlled—you will find Lewellen variable speed transmissions.

Here are two applications which show its flexibility and diversity of uses.

In one case a Lewellen Transmission is used as a governor drive on a Prosser type engine. In the other, a Lewellen is driving a Green cutting machine in the plant of the Stauffer Biscuit Company, at York, Pa.

In every industry you will find Lewellen Transmissions regulating speeds and giving better control of every speed requirement.

A Lewellen regulates the speed to a fraction of an R.P.M. It does not jerk, but the speed can be made to vary gradually from fast to slow and slow to fast, as required.

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There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN MFG. CO.
Columbus, Indiana

LEWELLEN
Variable Speed
TRANSMISSION

room roof. A 3-inch pipe line is then connected with the side of the reservoir at the base where the injector discharge line entered the boiler when in steam generation service, and connects with the intake side of the injectors inside the boiler room. A gate valve is installed in this line to shut off this hot water until ready to use it in the boilers in operation.

By connecting the trap discharge lines with the top end of the boiler, the operation of the five traps in discharging the water into the tank is better than if these lines entered the boiler at or near its base. For the discharge of the traps would be opposed by the gravity pressure of the filled reservoir against the lines at its base. The weight of the small column of water contained in the upright portion of the pipes beside the boiler is much smaller than that which would exist against their connection at its base or near it. The metallic character of the boiler hull retains heat in the water much more than a wooden tank would, especially with a long vent pipe as the only exposure to the water and its opening several feet away. A liquid reservoir tank of any type could be used as successfully as this old boiler, but the boiler had been discarded, failing to pass necessary tests to be continued in use as a steam generator and its cost of being put into service as a hot water reservoir consisted only of the time consumed by a shop force in converting it into one, which was done during idle moments.

Linoleum Strips in Aisles Increase Employee Comfort

By Jean Wade

IN the American Linen Supply Company's factory in Chicago, between 250 and 300 operators stand all day in front of their machines. The floors in the factory are hard concrete.

Some time ago the company had strips of comfortable battleship linoleum cemented to the concrete floors in front of all the machines. This use of linoleum, it is reported, not only adds to the comfort of the employees but improves their efficiency as workers because the mere effort of standing on the floors does not absorb so much of their energy. The linoleum is a durable material and its small cost is readily offset by the improvement in working conditions which its use brings about. Incidentally, too, linoleum is somewhat sound absorbent, and serves to deaden the noise of the machinery.

Electrically Heated Furnaces

COKE-FIRED furnaces, even though their fuel bills are exceptionally low, cannot compete with electric furnaces in the plant of the Mann Edge Tool Company at Lewistown, Pa., manufacturers of axes, hatchets, and similar edge tools.

Previous to August, 1926, they had always used coke fired furnaces for heating the tools before hardening and tempering. Since that time, electric lead bath furnaces have been in operation, the quality of the product turning out being far superior than under the old methods.

Under the old system, the heat-treaters were required to judge the temperature of the pieces in the furnace

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What Is Asphalt?

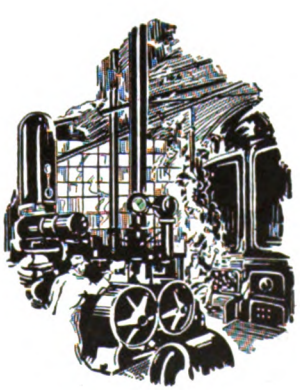
The man of science today regards asphalt as the most efficacious and durable waterproofing known. He knows also that asphalt will resist more acids and alkalies than any other substance. That is why

Valdura Asphalt Paint

with a base of 99.5% pure Gilsonite asphalt has come to mean the best in asphalt paint and the best to be obtained in preservatives.

VALDURA has worked hard in the industrial field because it has had hard problems to contend with. We would like to tell you how it has stood up under some of these particular requirements.

You will not be obligated in the least by writing for further particulars—probably you would like a sample for testing.

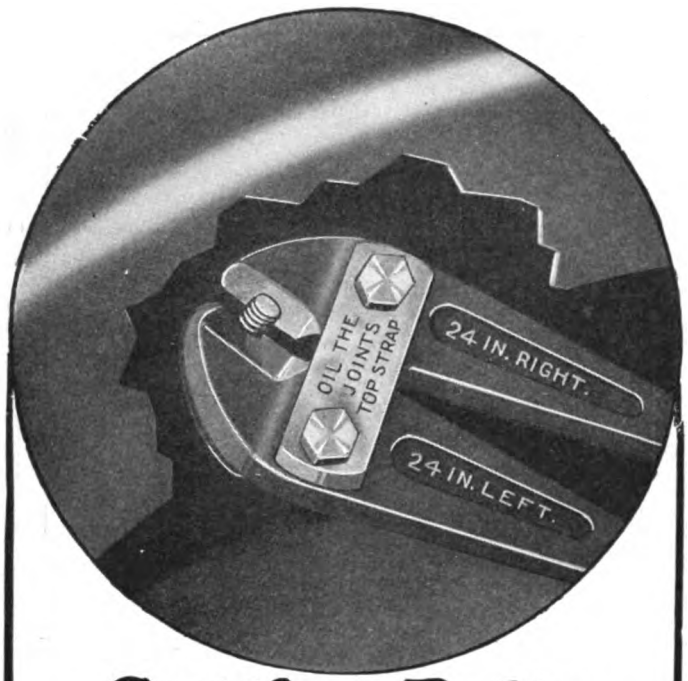


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844 Rush Street **Chicago, Ill.**

Distributed by all National Supply Co. Stores

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IN AWKWARD PLACES

Many times a bolt is so located that it is very difficult to get at. The workman must "stand on his head" or use a Porter Bolt Clipper fitted with angular jaws which cut with the handles at an angle to the plane of work. This tool saves awkward reaching and straining.

In the largest size it will cut a 3/8" bolt in the thread.



Time Savers
PORTER'S BOLT CLIPPERS

are cutting tools developing great power through leverage and a form of toggle joint. They multiply man-power about 70 times. Made in a number of styles for cutting bolts and rods, splitting nuts, cutting chains, etc. Moderate in cost and essential tool equipment for bench, shop, or kit.

Sold by Jobbers and Supply houses everywhere
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H. K. PORTER, INC.
EVERETT, MASS.



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their color, the quenching being done when the color changed to the proper shade of red or yellow. The intensity of the outside light affected the appearance of the color of the tools and the work would often be over or underheated. This naturally resulted in a large per centage of rejections. To overcome this, the windows were painted black and no lights were used in the hea treating room in an attempt to have always the same degree of darkness. This was only partially successful

The new heating equipment installed in August con sisted of two lead bath furnaces, one for hardening and one for tempering. They were installed on the basis of meeting a definite production schedule and to effect defi nite results in heat treatment, chiefly in cutting down the percentage of rejections. The hardening furnace oper ates at 1,460 deg. F. and has a capacity of 1,080 pound of steel an hour, when consisting of 4½ pound axes The furnace accommodates 20 axes at one time. The tempering furnace operates at 600 deg. F., the capacit being the same, 30 axes, however, being contained in th bath at once.

The blades of the axes are immersed in the molten lea up to the eye of the axe and are held in that position b suitable hooks. The operator merely fills the hooks, the starts back at the head of the line removing the hot axe for quenching and putting on a cold one for heatin Automatic control keeps the bath temperature with plus or minus 5 deg. F. of the required point witho any attention from the operator. This exact, unifor temperature control is largely responsible for the sple did results which have been attained by the Mann Co.

The furnaces in use measure 54 in. wide, 100 in. lo and are 30 in. high. The interior of the vessel holdi the lead is 12 in. wide, 60 in. long and has a depth 14 in. The hardening furnace has an electrical capaci of 60 kw. and the tempering furnace 35 kw., both bei connected directly to a 3-phase, 220-volt circuit. F hardening, 18 pounds of axes, and for tempering. pounds of axes are heat treated per kw. hour.

A bed of crushed coke, one inch in depth, is used cover the molten lead greatly reducing the heat radiati from the surface of the pots and also keeping down t amount of dross formed. Insulated covers are plac over the furnaces to conserve the heat during night sh downs.

Accident Prevention in Industrial Plants

By C. C. Hermann

THE greater percentage of accidents sustained the woodworking industry are on operations p formed by hand labor. That is, unloading cars, mov materials, floor work, and other operations not involv power driven machinery. One authority places the p centage of accidents classed as strains in lifting at twe per cent. of the total accidents sustained. A strain not, in the usual run of such accidents, serious, howe it incapacitates the workman for a period of time rang from a few hours to a number of days.

The strain is, perhaps, the easiest accident to sus due to the numerous muscles of the human body. example, the mere misplacement of the foot, the turn

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Constant Duty Reelite with Ball Ring Cable Outlet as used to supply current to magnet on Crane Tructor made by the Elwell-Parker Electric Company, Cleveland, Ohio

What you save on cable-renewals will quickly pay Reelite's cost

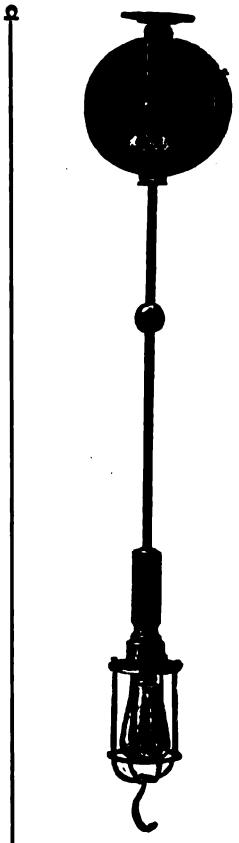
Wear and tear on costly cable is almost completely eliminated when you put Reelite on the job.

Because Reelite cares for cable far better than it can be done by hand—reels it in, pays it out, keeps it clean, unkinked, uncut, never allowing a slack foot, yet exerting no undue tension.

On portable or traveling machinery it will usually save its cost in a very short time by doing away with wear on cable and by releasing, for other duty, men who may now be employed in tending cable.

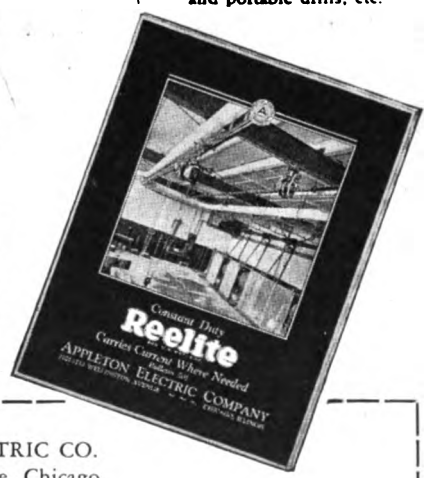
Reelite is particularly adapted for use in connection with portable hoists, traveling cranes, lifting magnets, boring mills and mobile transfer cars.

A profusely illustrated bulletin describing all uses and all models is just off the press. Send the coupon and we will mail you a copy at once.



Reelite

The handy light on a reel
For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connector in place of light so that it will furnish current for small machinery, and portable drills, etc.



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New York—150 Varick St. Los Angeles—340 Azusa St.

CONSTANT DUTY
Reelite
REG. U. S. PAT. OFF.
Carries Current Where Needed

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1716 Wellington Ave., Chicago
Gentlemen:
Please send us a copy of your new Bulletin 501-S
This obligates me in no way.

*Name*_____
*Address*_____
*City*_____ *State*_____

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POWER

The moving of heavily loaded cars requires a great amount of power.

The very appearance of the Atlas Car Mover suggests power. Its scientific construction develops power, sufficient to move the heaviest cars and still have a margin of reserve.

Its positive grip spurs never fail to hold and assure perfect safety.

A locomotive as far as practical results go, it places cars with an astonishing speed and ease.

OUR POLICY IS TO SELL THRU THE JOBBER



The Famous

ATLAS CAR MOVER

Manufactured Only by

Appleton Car Mover Co.

Appleton, Wis.

"Washing removes the dirt —*but not the paint*"



Says manufacturer of well-known paint product.

ANY paint that will bear washing will wash *better* with OAKITE than with other materials. Factories and mills everywhere have been using it for 18 years. OAKITE contains no grit, alkali or soap. It is ALL cleaner! It rinses easily and quickly. One-half to one ounce of OAKITE to a pail of warm water will freshen and brighten painted walls, ceilings, woodwork or equipment. There will be no discoloration or streaks.

Ask to have one of our service men call and show you in a practical way, how you can save money by using OAKITE for all factory or mill cleaning.

Oakite Service men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

OAKITE IS MANUFACTURED ONLY BY
OAKITE PRODUCTS, INC., 40A Thames St., NEW YORK
(Formerly OAKITE CHEMICAL CO.)

OAKITE

Industrial Cleaning Materials and Methods

over of a block of wood on which one is standing, th sudden twist of a plank held in the hand and numerou other ways some muscle of the body is given a sudde twist which results in a strain.

There are numerous degrees of strains. Perhaps th muscle has just been stretched without tearing the fiber At times the fibers are separated and torn which resul in a very painful injury. The latter may incapacitate th workman for weeks depending upon the extent and loc tion of the torn members.

Lifting is productive of the great majority of strain Much depends upon the ability of the workman to es mate the weight of an object. Again a weight whi would be very easily handled from one position wou produce a bad strain if handled from another, as for e ample, from a higher elevation. Obviously, a supervis cannot determine the relative hazard of all such con tions. One man may perform a given effort witho injury whereas another workman would sustain a pa ful strain from performance.

The best that can be done with such items is to wo toward their elimination. To this end lifting and sta ing trucks are found indispensable. The stacking tru is found available for piling and unpiling such items barrels, boxes, piles of material and other arrangeme of material up to 2,000 pounds. Obviously a handl of material in such quantity involves a reduction in terial handling costs as well as a reduction in acci Such equipment is considered as machinery adapte the vertical movement of material, a phase of indus operations productive of accidents.

Man power is concerned through the utilization of principle of the lever. This principle is also involve the design of the lift truck adapted to the longitud movement of materials. When taking on its load the truck leverage is ample to enable a child to manipulat maximum load and its unloading involves no more t the pressure of the heel.

Very few accidents are due to direct pulls. A can exert his entire strength in a pull without inju himself. His muscles become tired after a time rarely does he produce a strain unless it is because pulling in some cramped and distorted manner. example, the mere pulling of a truck provided wi handle is hard and tiresome labor but it does not inv an accident unless the workman should stumble, or turn an ankle. The same consideration applie pushing. The human body is so constructed that a or a pull in the ordinary and safe method of perfor these functions is comparatively safe.

Likewise, the carrying of an object does not inv a hazard in the ordinary sense. The hazard is only pr nent in the possibilities connected therewith. The w man may be carrying a comparatively heavy load. slightest slip of a foot may tend to unbalance him ar injury results.

Bulk in material results in many accidents rather weight. Where the center of gravity of the o handled can be brought close to the body there is likelihood of accident. The object, with regar weight, may be well within the capacity of the work but, due to its bulk the center of gravity positioned distance away. The man is then eccentrically l beyond his capacity. We can understand this noticing how a column will sustain a heavy load the load is placed directly above it. However, as

dvertised in this issue write Industry Illustrated

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STANDARD TOOL CO.

The "Red Shield" is the latest achievement in the art of Drill making



The chief points of merit are:

"High Speed Steel"
of special analysis
Workmanship
Construction
Ample chip capacity
Size and strength of shank
Uniformity
Temper
Less breakage
More holes
Long service
Less grinding
Less cost per hole

With 46 years' experience

we pronounce the "Red Shield" the best drill yet produced.

It is a combination of Forged and Milled construction with correctly proportioned range of shanks to drive the Drill to fullest capacity.

Designed for all-around heavy duty

The "Red Shield" is imprinted on each Drill.

THE STANDARD TOOL COMPANY

NEW YORK CLEVELAND CHICAGO

UNIQUE THIN LEAD COLORED PENCIL



"UNIQUE" THIN LEAD Colored Wooden Pencil—has the best and most usable *thinnest* lead of utmost strength and durability. Can be sharpened in a pencil sharpener to a needlepoint.

12 Colors
$1.00
per dozen

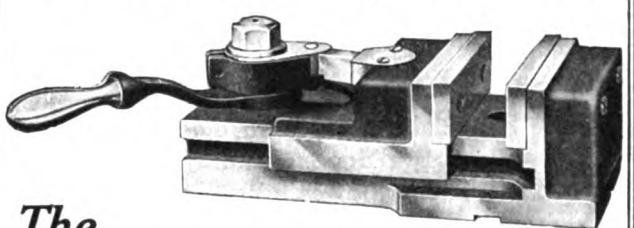
Make fine lines in color for
figuring
checking
underscoring
blueprints
charting, etc.

The 12 colors enable executives to have their own symbol.

No.		No.	
Blue	1206	Orange	1214
Red	1207	White	1215
Green	1208	Lt. Blue	1216
Yellow	1209	Pink	1217
Purple	1210	Lt. Green	1218
Brown	1212	Maroon	1219

At all dealers, or write direct
AMERICAN LEAD PENCIL CO., 206 Fifth Ave., New York
Makers of the famous VENUS Pencils

Wherever a Quantity Must be Quickly Handled



The
"PRONTO"
Quick Operating and Wide Opening Lever Vises

Made in Three Sizes

No. 1—6¼" long—8 lbs.....$50.00
No 1½—8⅛" long—17 lbs..$60.00
No. 2—9¾" long—33 lbs....$70.00

Prices Subject to a Discount of 45%

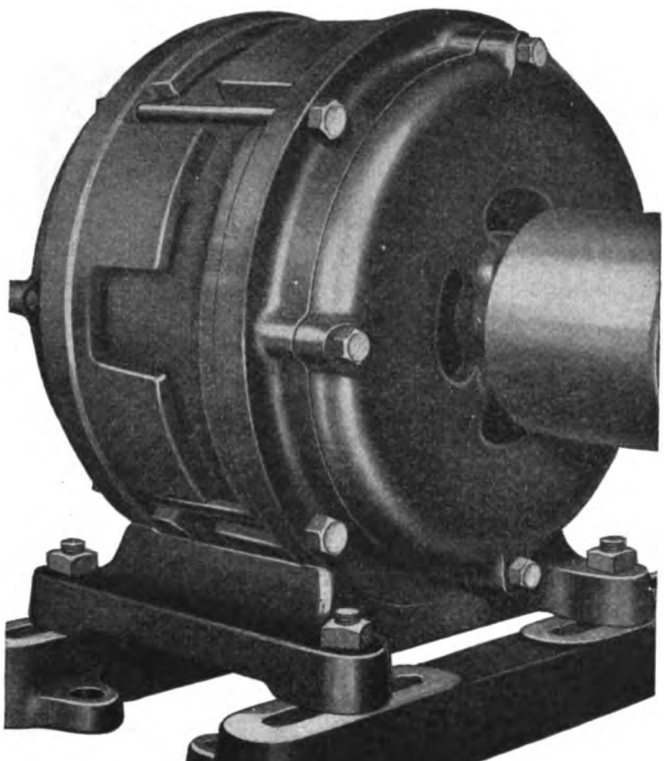
A slight movement of the lever and the jaws close with a grip of steel. This is just what you need where a great many pieces must be handled and handled quickly.

Designed for Milling and Drilling Machines

"PRONTO" Quick Operating and Wide Opening Lever Vises are made in the sizes shown. Write for descriptive circulars.

Manufactured by
EDW. PURVIS & SON
Successors to Carter & Hakes
110 YORK STREET BROOKLYN, N. Y.

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Does Friction Cost You 75% too Much?

TESTS have shown that for every 100 watts necessary to overcome friction in a babbitt bearing motor only 25 watts are required by Valley Ball Bearing Motors.

The ball bearings used in every Valley Motor greatly reduce friction. And that in turn reduces power bills.

This is another reason why we can say that Valley Motors cost less to operate . . and do more.

Polyphase ¼ to 40 h. p., and Single Phase ¼ to 3 h. p. Write for descriptive bulletin.

VALLEY ELECTRIC CO., ST. LOUIS, MO.

***District Offices:* Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco**

Valley

as the load is shifted to one side or the other the colum fails.

Balance is a fundamental function. The sum of tw loads, one carried in each hand and therefore balance will be much greater than the maximum load possibl to be carried in one hand. Where considerable carryin is to be done the principle of balance should be studie with the view of obtaining this desirable characteristi When carrying a load in one hand or to one side of th body the body assumes a crooked position in attempti to get the load as nearly as possible over the point support, the feet. This produces a cramped position f numerous muscles of the body resulting not infrequent in an accident.

As long as we must depend upon the feet to elimina much of the hazard we should give more attention to th feet and the surfaces with which the feet come in co tact. Slippery surface conditions are extremely hazar ous. If loads are to be passed over such conditions th are akin to criminal. It is not beyond the capacity industry to eliminate many of the slippery places abo the plant. Travelways for hand loads should be cover by all means. Sleet, ice and snow produce a hazard such surfaces. Rain produces slippery conditions a refuse such as grease and vegetable matter lying arou are exceedingly hazardous.

Travelways should be rough surfaced. Metal pla are extra hazardous unless they possess non-slip su faces. Cement surfaces should be non-slip produc thus by the incorporation of a non-slip substance on surface or by the usual method of finishing with a b lap trowel. Wood floors are best when the planks not parallel the line of travel. All these things must given consideration if industry is desirous of eliminat a portion of this twenty per cent. of strain accidents.

The workman should be just as much interested the elimination of foot travel accidents as the employ Much can be done in the way of foot wear to incre the margin of safety. Above all, heel and toe pla should be abandoned. No metallic surface should worn on the sole of the foot. Even the projection nails in the shoe result in increasing the hazard. Rub heels are exceptionally good on workmen's shoes. rubber heel not only reduces the tendency to slip but to its resiliency reduces the fatigue involved in walk and carrying loads. The expense involved in the use rubber heels is not sufficiently greater than leather make this a determining factor. The loss of a sin day at work would pay for the heels worn away for entire year, yet many workmen pay several times toll by attempting to save the slight difference.

The practice of workmen to purchase clothing the legs much too long in order to allow for shrinkage creases the percentage of accidents. The large cuf the bottom of the trouser leg is a hazard. Garm makers can assist here by shrinking their material be the garment is made and thereby permit the purchas the correct size without the concurrent loss to the w man. In fact, much can be done in eliminating the leg in workmen's garments and thereby reduce the n ber of accidents involved through tripping.

For ised in this issue write Industry Illustrated

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"HALLOWELL" ALL-STEEL Factory Equipment



These Tool Stands *make for faster work!*

With "Hallowell" All-Steel Tool Stands you move the tools to the job, instead of the job to the tools. Quicker. Easier. Broad open shelves—tools always in sight, no need of men spending time hunting the right one.

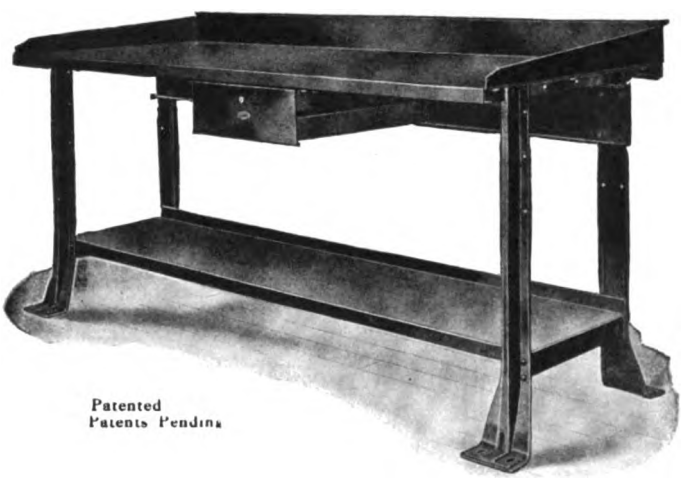
"Hallowell" All-Steel Drawers may be had, of course, when desired; so can sliding trays for smaller tools. Tool stands can be ordered with or without casters.

Ready-made Benches in all sizes, *cost less!*

"Hallowell" All-Steel Work Benches need no carpenter's time. Won't splinter. Can't burn. Stand up under loads that ruin ordinary wooden benches. All sizes. Always in stock. You can get them when you want them in any number, too!

If you prefer wooden tops "Hallowell" All-Steel Bench Legs are at your service.

Send for special bulletin No. 357—complete descriptions of "Hallowell" All-Steel Factory Equipment.



Patented
Patents Pending

"Hallowell" All-Steel Shop Equipment is listed in the service manuals of Buick — Hudson-Essex — Chevrolet

Standard Pressed Steel Co.

Box 8, Jenkintown, Penna.

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Four Wheel Brakes ~ On the Vise!

A turn of the bolt—the base is locked! As quick and positive as four wheel brakes in an emergency. Nor is that all. You will find this type of locking feature on the Parker Vise only—an exclusive patented feature which gives the Parker Swivel base a big advantage over all others.

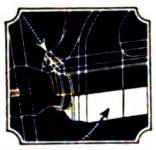
When the bolt is turned down the wedge is pulled up, expanding the split ring with a positive grip around the whole 360° of the base.

Write to W. R. B. for Catalog 57B

PARKER VISES

Meriden, Conn., U. S. A.

Other Exclusive Features of Parker Vises



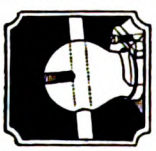
Solid Underportion in Slide



Renewable Steel Jaws



Swivel Base 360° Gripping Power



Handle Stays Put



POWELL PRESSED STEEL MATERIAL HANDLING EQUIPMENT



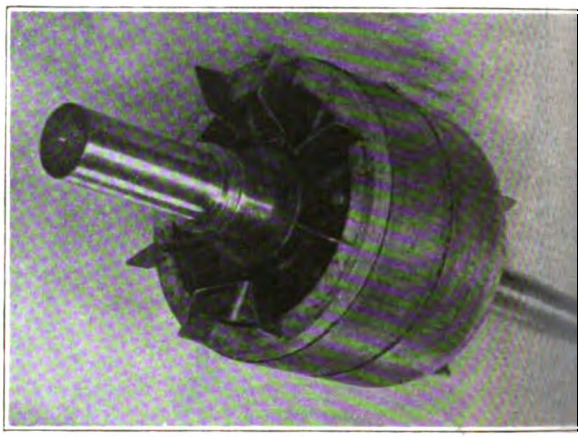
An Enviable Reputation for Long, Money-Saving Service

WHEREVER they are in daily use—in hundreds of plants of all sizes—POWELL Platforms and other pressed steel Material Handling equipment have won exceptional records for service and economy. They handle heaviest loads, save time and labor, and promote increased efficiency throughout every department. Write today for copy of our booklet, illustrating the entire POWELL line.

The POWELL PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

New G. E. Motors for General Application

A NEW type of induction motor which, with its c trol, is even simpler to operate than the ordin squirrel cage motor and compensator, is announced the General Electric Company. A complete line of th motors, bearing the type designation FT and rang in ratings from 7½ to 50 horsepower, has been pla on the market.



The new motor marks the culmination of several y of investigation, development and research in the deavor to meet the demand for a motor embodying plicity, reliability, low cost and line switch control in ing full voltage starting. While large numbers of reactance motors of somewhat similar characteristics been built and applied during the period of developr this is the first coördination of a complete line for ge purpose application.

The FT motor is in general suitable for applic wherever the ordinary squirrel cage induction motor a compensator has been used. It is designed to on full voltage giving slightly higher starting t but approximately the same starting current as the nary squirrel cage induction motor started with the pensator connected to the 80% tap.

Quick Humidity Char

By N. G. Near

THIS simple chart gives the relative humidit stantly without the use of tables and withou figuring.

It is based on a formula recently derived by the Bureau of Standards. The formula, however, in logarithms, and as logarithms are not easy for every to use the writer developed this chart which an can use.

Simply run a straight line through the dry bulb perature, Column A, and the wet bulb temperature umn B, and the relative humidity is instantly giv the intersection with Column C. Or, just stretch a thread across the chart.

For example, if the dry bulb temperature is 1 grees F. and the wet bulb temperature 85 degre what is the relative humidity? This chart is quicke tables or figures.

Answer: The dotted line drawn across the chart

For ertised in this issue write Industry Illustrated

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Union Universal Saw



No Noisy Gears

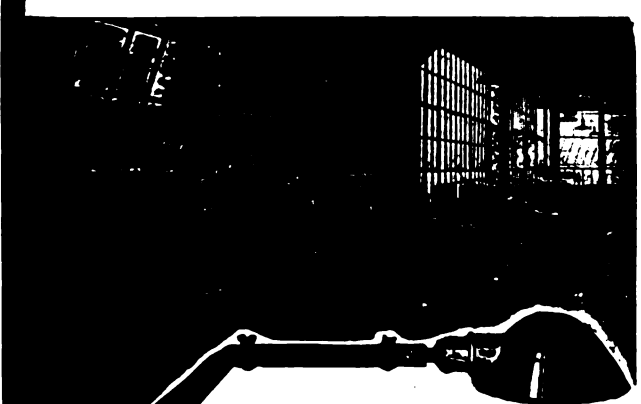
Counting the Cost

Durability, speed and accuracy are the first essential requirements of a woodworking machine. A machine that gives you this and one thing more, LOWER OPERATING COSTS, MEANS GREATER PRODUCTION AND GREATER PROFITS.

Every Union machine meets fully these first requirements, and in addition will do your work at less cost.

Before you buy, let us explain the advantages of Union Machines.

GALLMEYER & LIVINGSTON CO.
412 Straight Ave., Grand Rapids, Michigan



LIGHT!

where and when needed

The economy of an American System as compared with a flood light system is found in the fact that the light is placed exactly where needed, and it is used only when needed.

No flood lighting of great areas with the resultant shadows on the tools just where light is most needed—but light accurately placed which guarantees greater and better production.

...e make a sur-
...d your light-
...e—write to-
...booklets, or
...presentative's
...ice, or both.

...merican Fixture Company
...2 West Water Street Milwaukee, Wis.



ECLIPSE BRITEN-ALL

An Economical, Lasting, White Finish

Most factories, mills and warehouses desire a white finished wall, but in most cases a white finish will not last any great length of time without being washed or repainted.

ECLIPSE "Briten-All" gives a finish as white as the most expensive wall paint, **yet it costs much less.** It is easy to apply, requires only one coat and adheres firmly to the surface for a long time.

ECLIPSE "Briten-All" is intended for all classes of interior work where light reflecting and brightening-up standards are paramount. In fact, some concerns find it more efficient, from a light diffusing standpoint, to finish their walls with ECLIPSE "Briten-All" every one or two years instead of washing them—and more economical, too.

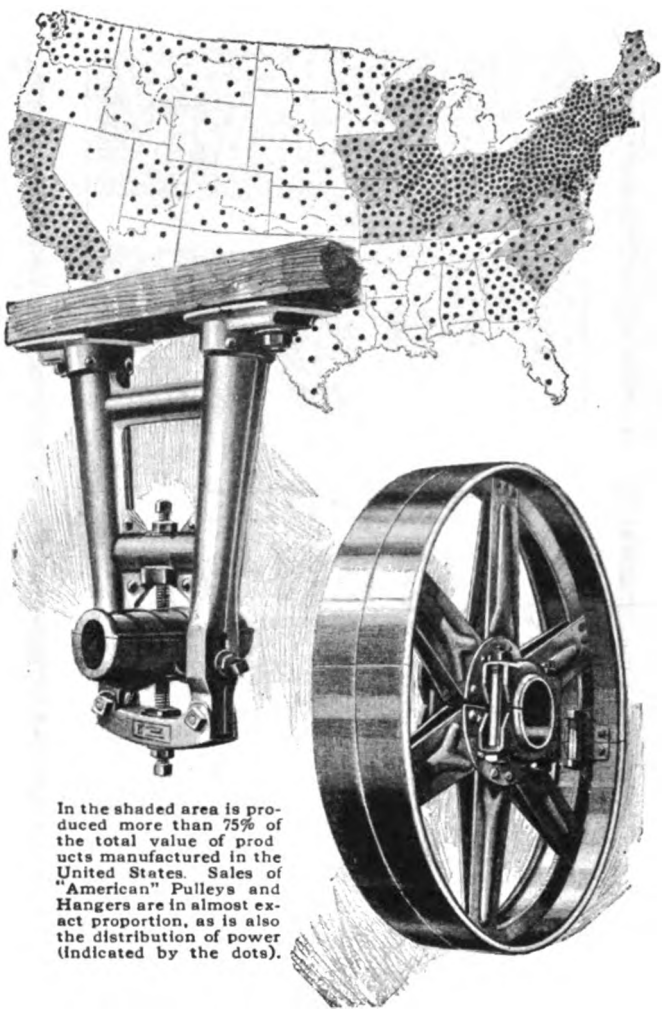
You receive one-hundred cents worth of wear for every dollar you spend for "Briten-All" and your walls will be whiter and cleaner.

Detailed information with sample panel gladly sent on request.

The Eclipse Paint & Mfg. Co.
Cleveland, Ohio, U.S.A.

Dallas Denver
Philadelphia San Francisco
Newark
Charlotte, N. C.

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In the shaded area is produced more than 75% of the total value of products manufactured in the United States. Sales of "American" Pulleys and Hangers are in almost exact proportion, as is also the distribution of power (indicated by the dots).

Where There's Power There Are "Americans"

AS "commerce follows the flag," so are American Pressed Steel Hangers and American Steel Split Pulleys found wherever power is used in industry.

Where commerce and industry flourish, you will find the greatest number of "Americans" delivering power at a rating more economical than was thought possible thirty years ago; before the first American Steel Split Pulley was made.

There are additional advantages to the use of American Steel Split Pulleys and American Pressed Steel Hangers — advantages you should know more about

The story is told more fully, but briefly in "Worthy Companions." Write for a copy.

For nearest distributor see MacRae's Blue Book

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys Pressed Steel Shaft Hangers Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia

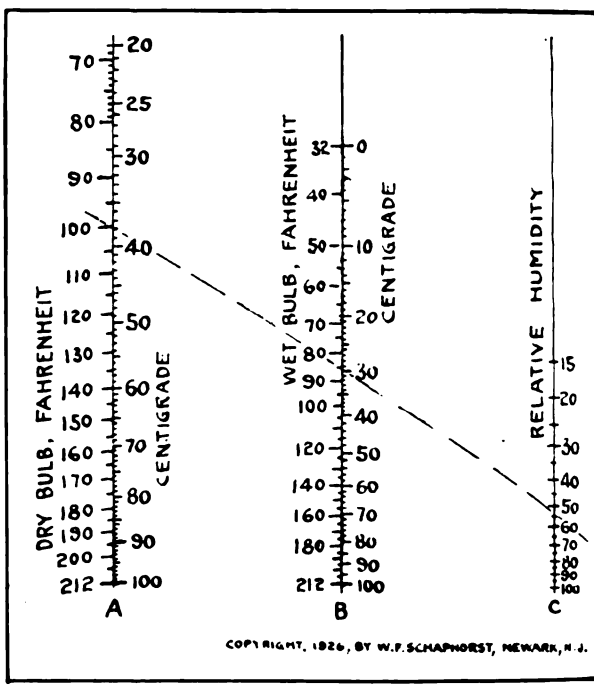
AMERICAN

PRESSED STEEL HANGERS | STEEL SPLIT PU[illegible]VS

PATENTED

how it is done and shows that the relative humidity, Column C, is 54 per cent. Could anything be simpler?

Another advantage of this chart is that it gives temperatures in both Fahrenheit and Centigrade whereas the formula is Centigrade. Very few are familiar with the Centigrade scale.



For those who would prefer to use logarithms, here the rule on which this chart is based:

(a) To the wet bulb temperature in degrees C. a 20;

(b) To the dry bulb temperature in degrees C. a 20;

(c) Divide (a) by (b).

(d) Raise the quotient to the 4.3 power.

The result is the relative humidity.

This rule has been tested out by the Bureau for bulb temperatures between 20 and 100 degrees Centigrade.

Try an' Find It

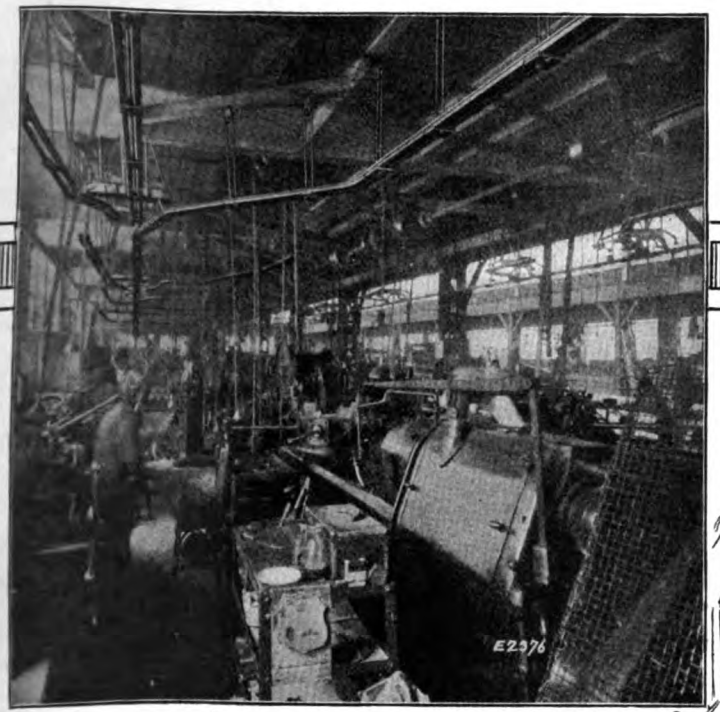
By N. E. Work

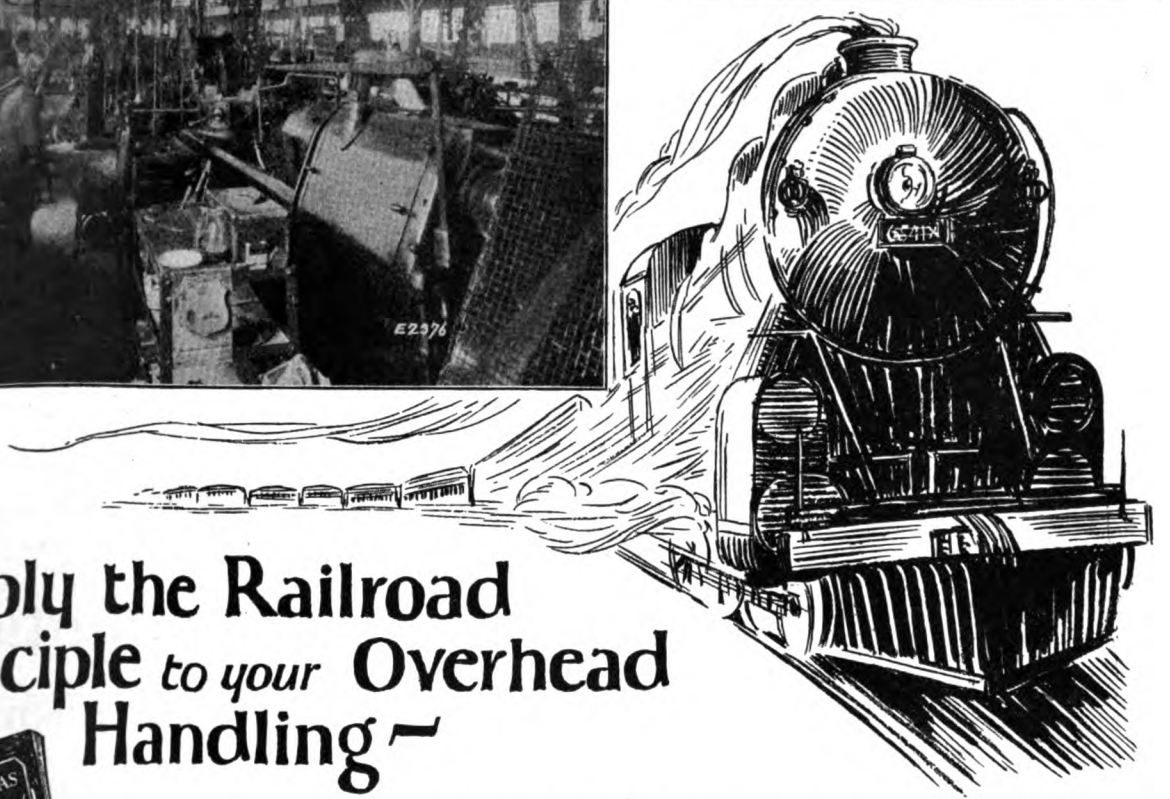
WE seem to be rapidly approaching the try-find-it age. Sometimes I think we are in it ready. Take radio for example. But finding New leans, Peoria, and Honolulu aren't so bad alongside some of these new-fangled trick envelopes which the words printed across them: "There is a letter insi

My suggestion is that to those words should be add "Try an' find it." Many pounds of brains have ap ently been worn out doping out schemes for hiding a catalog and a letter within the same envelope and t and sealing them in so securely that they can hardl extricated even after they are located.

The X-ray people are losing out on an excellent op tunity to sell more machines for finding things of this within envelopes. After an unusually successful se the other day in one of these dual envelopes I lo the hiding place of the letter, performed an oper with my pocket knife, and read this enlightening in mation: "We are sending you herewith our catalog.

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Apply the Railroad Principle *to your* Overhead Handling—



"The ATLAS of Handling" offers you a valuable treatise on the subject of materials handling and shows why the railroad principle of overhead handling is the most economical means of conveying. We will gladly send you a copy.

Safer, steadier, more efficient ceiling transportation is now possible with the DUO-RAIL System—which brings to industry the railroad principle of two rails instead of the unsteady single rail.

Especially Adapted For the Toughest Handling Jobs

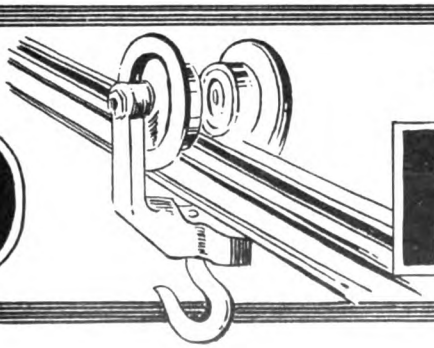
Wherever installed the DUO-RAIL handles heavy or hard-to-handle loads with speed and without the rough, jerky, unsatisfactory motions of the single rail.

The DUO-RAIL handles glass, wet enamel ware, pottery, cement forms, foundry flasks, molten metal and other hard-to-handle products with facility and dispatch. Write for all the facts.

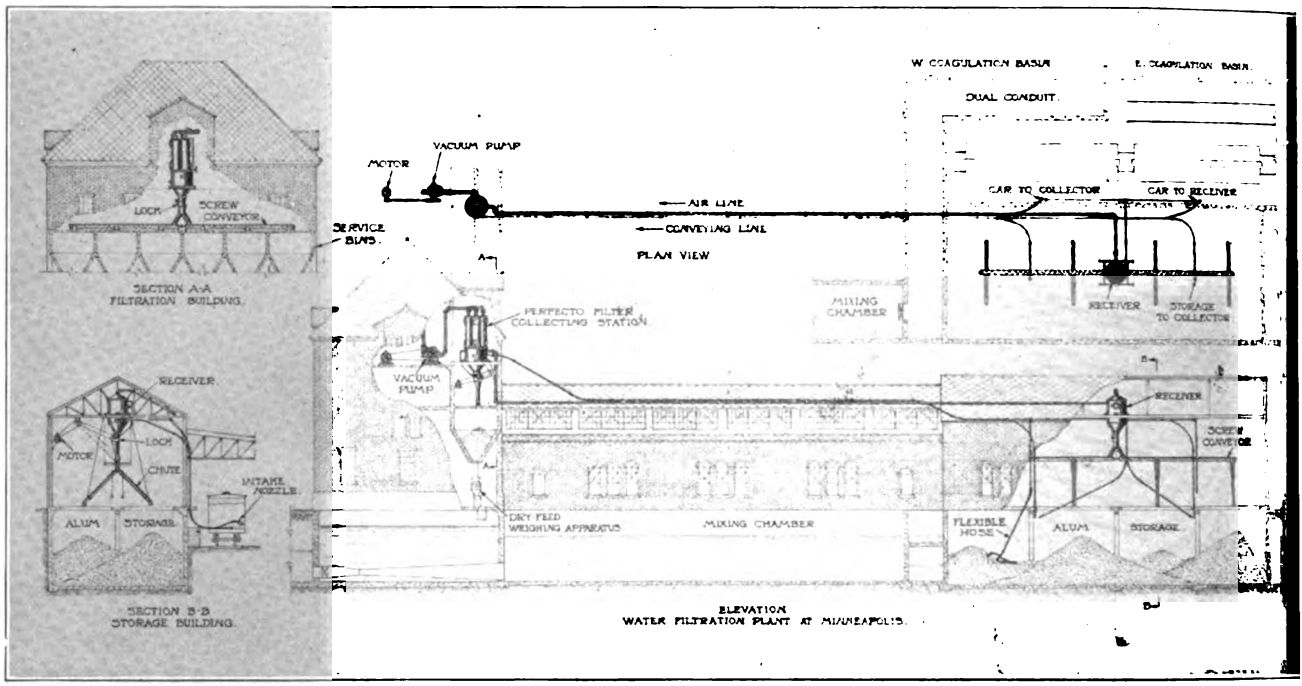
The ATLAS-CHICAGO COMPANY

Division of Chicago Electric Company

742 West Van Buren Street, Chicago, Illinois

The Atlas DUO  *System* RAIL

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Another
"DRACCO"
Installation

a Pneumatic Alum Conveyor for Water Filtration Plant

If you transport, handle or convey dry materials, such as Soda Ash, Lime, Antimony, Oxide, Lithopone, Fuller's Earth, Sand, Sodium Bisulphate, Talc Powder, Crushed Bone, Fertilizer and other similar dusty, injurious materials, then you will be interested in this installation.

The City of Minneapolis now transports eight tons of Alum per hour from cars and primary storage to service hoppers. Since it installed a DRACCO Conveying System at the Fridley water filtration plant, the dust is filtered from the air so that not over 2½% of the dust will pass from the receiver to the collector and filter.

A DRACCO Dust Recovering and Conveying System will reduce your labor turnover, cut down fire and health hazards, save valuable materials, and above all, give you clean, healthful work rooms. Our engineers are ready to go over your requirements and suggest the DRACCO System most applicable to your conditions.

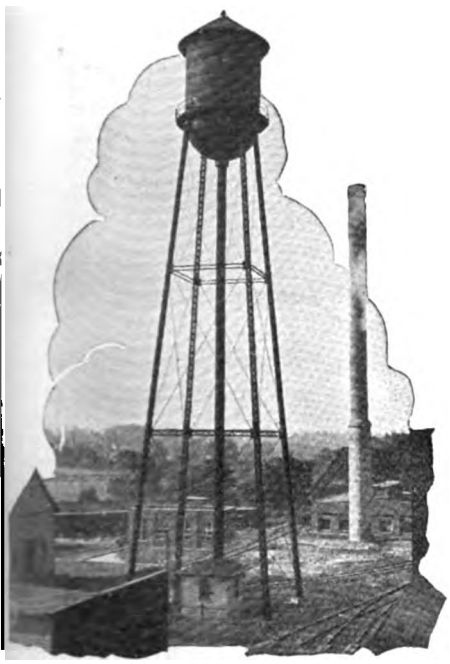
Write for Bulletin 515 which describes this installation.

The Dust Recovering & Conveying Co.
Harvard Ave. at E. 116th St., Cleveland, O.

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Another Disaster Charged to "Lack of Water Pressure"



Another example of adequate protection with a Horton elevated tank

THE report of this disastrous fire says, "Lack of water pressure hampered the efforts to prevent the flames from spreading; 16 blocks were burned over before it was finally controlled."

There is no "lack of water pressure" when you have an ample supply in a Horton elevated tank. Gravity furnishes the pressure and gravity is never found lacking. A suitable sprinkler system supplied from a Horton elevated tank will stop the fire while it is small and before it gets dangerous.

The Horton elevated tank illustrated here has been providing ample water pressure for fire protection in this plant for 20 years. It is still in good condition and apparently has years of useful service ahead of it.

We will gladly quote on a tank to meet your requirements.

Chicago Bridge & Iron Works

Chicago	2465 Old Colony Bldg.
New York	3169 Hudson Terminal Bldg.
Cleveland	2238 Union Trust Bldg.
Dallas	1658 Dallas National Bank Bldg.
Atlanta	1023 Healey Bldg.
San Francisco	1043 Rialto Bldg.
Havana, Cuba	Apartado 2507

HORTON TANKS

I.I.5-Gray

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Just Whirling Along
On Service Ball Bearing Casters



Service Push-E-Z Trucks with Service Ball Bearing Casters carry a load of 4500 lbs. and this is conservative. They start and roll with but slightly over one-half of the pull exerted in moving the average truck. Built for use and abuse for years to come.

YOU wouldn't want wagon wheels on your automobile—why make your internal transportation suffer with poor casters? It's what carries the load—That counts!

For constant, continuous, dependable service—For strength when the load's piled high—For efficient and economical haulage costs—Specify Service Ball Bearing Casters.

Ever alert—ready to go—with easy speed—any distance—any direction—for years to come—Service Casters are standard equipment in hundreds of factories the country over. They are paying for themselves over and over again throughout their many years of faithful service.

Service Casters have no competition where quality casters are demanded. Their patented exclusive features place them in a field by themselves.

Roll your haulage problems away on "Service"—*They are cheaper on the long run.*

Let us tell you and show you how they will save time, men, and money. Clip the coupon for catalog, prices, and full information.

THE SERVICE CASTER & TRUCK CO.
519 No. Albion Street **Albion, Michigan**

Sales Offices and Distributors in All Principal Cities

Service Caster & Truck Co.
Albion, Michigan.

Kindly send me without the slightest obligation, full information on:

- ☐ Service Ball Bearing Casters
- ☐ Service "Big Pat" Trailers
- ☐ Service Push-E-Z Trucks
- ☐ Service "Big Mike" Tri-wheel Hand Trucks

Name .....

Firm .....

Address .....

.....

I. M. 5-27

SERVICE
Casters *and* Trucks

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BRINGING THE TEMPERATURE TO YOU



Directly from the Engine

As every Diesel engine operator knows, cooling water and lubricating oil temperatures must be watched constantly.

The modern way of doing this is to bring the temperature directly to you by means of Motoco Industrial Thermometers.

Two desirable ends are thus accomplished: 1. The reading is taken at a convenient, accessible point, and 2. Closer readings of these essentially accurate instruments make possible more thorough temperature checking.

Send for Catalog No. 9 and get the full details now.

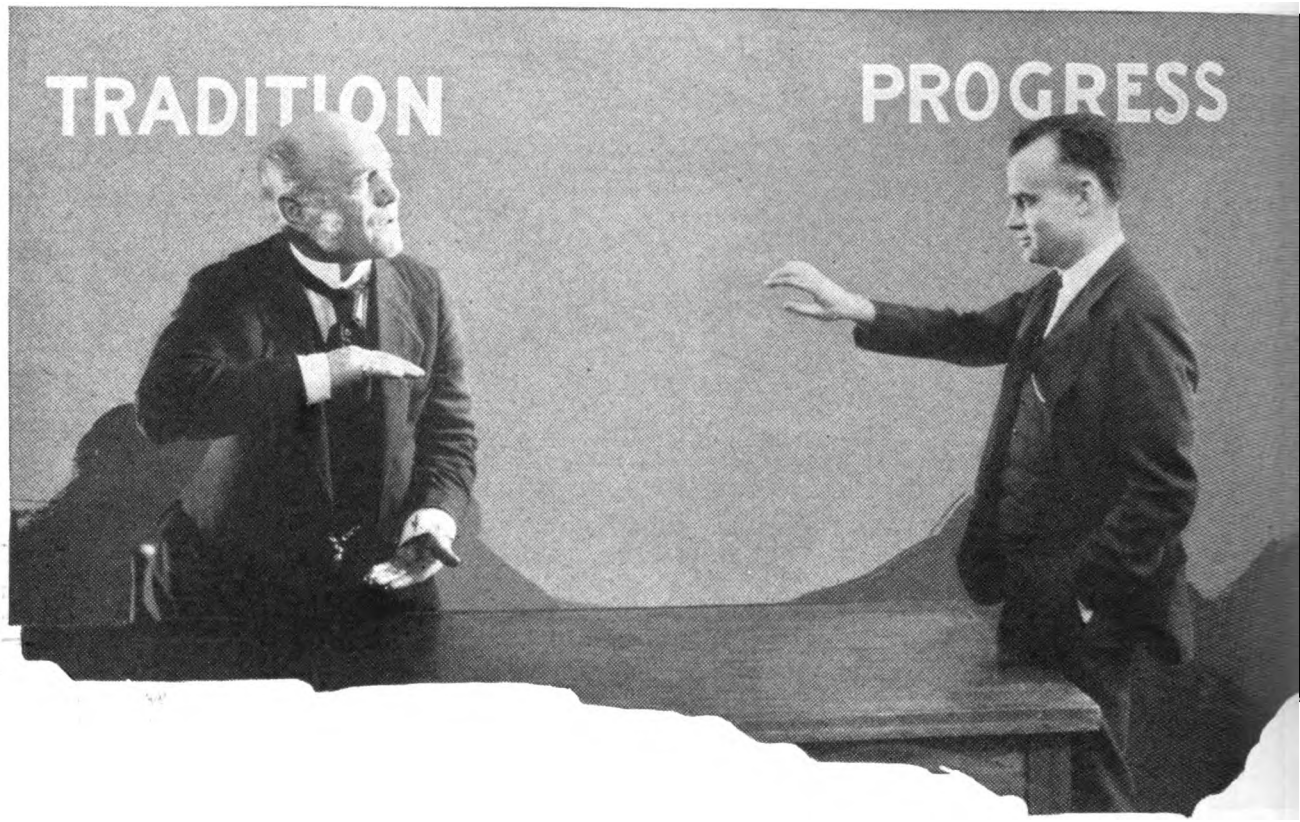
The MotoMeter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.
Chicago Office, 820 Tower Court
National Gauge & Equipment Division, La Crosse, Wisc.
The MotoMeter Co. of Canada, Ltd., Hamilton, Ont.

The Industrial Division offers the services of its engineering staff to manufacturers requiring thermometer equipment.
The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

Motoco Industrial Thermometers may be obtained in various ranges between Minus 40° F. and Plus 750° F.

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Pop wants a change



"Listen, Lad—

we've got to change our foundry! Why is it that we can't get service? The first company we had made rotten castings. Then we changed and got a company that made good castings but always balled things up. Then we got *this* company but we can never bank on delivery.

Let's get *another* company."

"No, Pop—

you're still on the detour. Remember, Pop, in the old hymn-book you used sing:

So when a raging fever burns
We shift from side to side by turns
And 'tis a poor relief we gain
To change the place, but keep the pain

Now, if ever anything gave industry a definite seated, specifically located pain, it is *castings*—

The pain of design
The pain of pattern-making
The pain of housing
The pain of rejects
The pain of delivery
The pain of handling
The pain of breakage
The pain of replacement.

'Stable-Arc' welding of steel shapes will pu industry of all this pain — which our auditor sp p-a-y-i-n."

A new text book on Arc Welding (Price $1.50) will be sent on approval for five days to any executive requesting it.

Book size, 6"x9"—Total pages, 160—Number illustrations, 200—Charts, 62—Divisions, 8.

The Lincoln Electric Co., Dept. No. 18-5, Cleveland, Ohio

"Stable Arc"

LINCOLN WELDE

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INCREASING PRODUCTION AT LOW INVESTMENT COST



A Maryland Metal Building—150x50x14—erected for the B. & O. R. R., for use as a woodworking shop.

ECONOMY

WHEN additional plant capacity becomes necessary, the time factor and cost are the two principal points to be considered.

The true cost of a building is its first cost, plus maintenance and depreciation for a period of years. The special material which is used in

Ivonore Metal
an Alloy

The Corrosion-Resisting Alloy

the Maryland Metal Buildings exclusively, places these buildings on the same permanency basis as a structure of brick or concrete, but *a Maryland Metal Building costs less per square foot than any other type of substantial construction.*

When, to this low first cost, is added the equally important factor of minimum maintenance and depreciation, it becomes evident that the outstanding feature of the Maryland Metal Building is its practical economy.

Practical economy has sold the Maryland Metal Building to careful concerns such as the Bartlett-Hayward Co., U. G. I. Contracting Co. of Philadelphia, Shambow Shuttle Co., Greenville, S. C., and hundreds of others.

It will convince you, if you will thoroughly investigate the relative merits of the Maryland Metal Building.

Clip and mail the coupon today for complete information.

I. G. 5-27

Maryland Metal Building Co.,
McComas and Race Streets,
Baltimore, Maryland

Please send us a copy of your catalog. We are interested in a building, size..... x.....to be used as..... What would such a building cost?

Name _____

Firm _____

Address _____

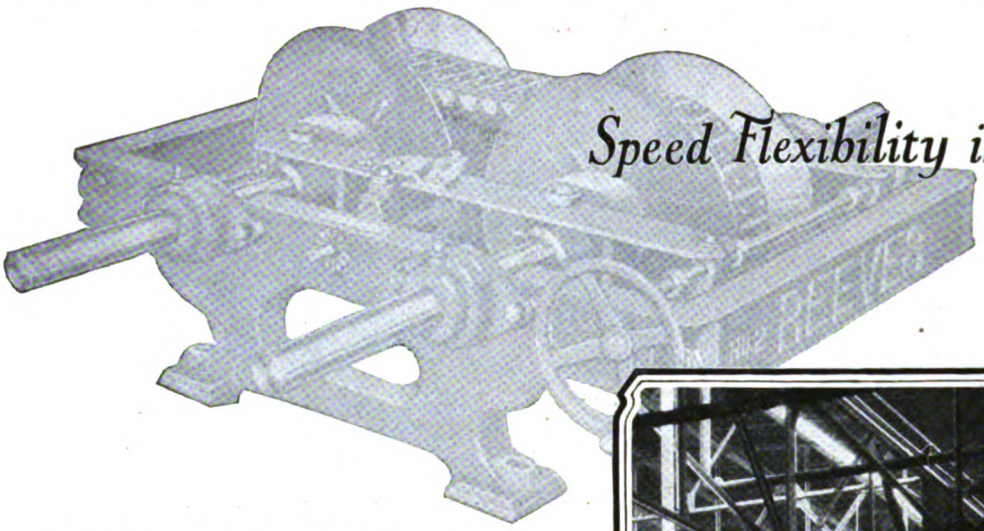
MARYLAND METAL BUILDING COMPANY

Main Office and Factory, Baltimore, Md.

30 Church St., New York 716 Pennsylvania Bldg., Philadelphia
419 Rhodes Bldg., Atlanta, Ga.

MARYLAND METAL BUILDINGS

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Speed Flexibility is VITAL!

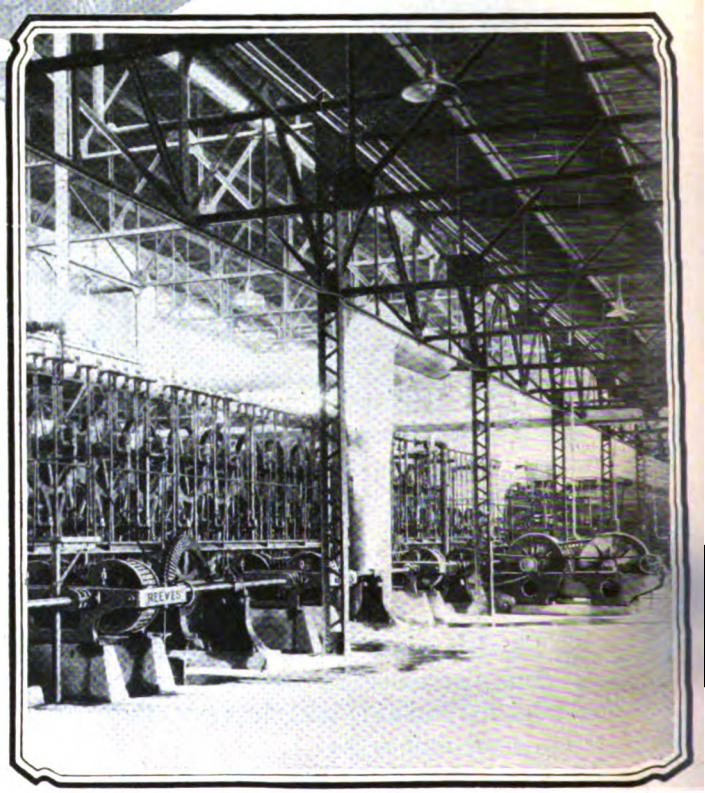


Photo taken shortly after installation at the Manville, N. J. plant of Johns-Manville, Inc. Six No. 6½ REEVES Transmissions control the sections while one No. 9 controls the entire unit. The speed of the machine or any part can be adjusted to meet any requirement.

THE REEVES Transmission is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. It does not give just *steps* in speed—but *any* speed between fastest and slowest, even to the smallest fraction of a revolution.

The REEVES may be mounted in any convenient position—on the floor, wall or ceiling—or it may be incorporated right into the machine it is to regulate. It is easy to install and simple to operate. Pays for itself in a short time. Lasts for years. Accurate and dependable, always.

In addition to the standard hand wheel control, REEVES Transmissions may be equipped with electrical remote and mechanical remote controls, so that merely by pushing a button or pulling a cable, you can regulate instantly the speed of any machine. Also, for special installations, several different types of automatic controls have been designed, eliminating the need for an operator.

The REEVES has an efficiency rating of over 96%. Force-feed lubricated—complete ball-bearing.

Flexibility for *Your* Machines

TAKE a conveyor right in your own plant. If it is REEVES-equippe you can run it at *any* speed you desire—one foot per minut two, three, fifteen, sixteen—*any* speed between fastest and slowe is instantly at your command. Our catalog G-66 tells the ma economies and advantages which the REEVES has brought to oth manufacturers in your industry. Write us for it.

REEVES PULLEY COMPANY
Established 1887
COLUMBUS, INDIANA

REEVES
Variable Speed Transmission

INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

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SHIRK

"A drink of water," he suggests to some, and the parade starts. "Let's visit awhile," he says to others, and idle argument begins. "Gee, but it's nice outside," he passes the word around, and here and there men stare vacantly out of the windows. Production lags.

But even wasted time isn't as serious as the spoilage that goes with it. Unwatched machines bite too deeply—jobs turned out only half done—errors that pass inspectors, also fagged by Bad Air. The total cost is staggering.

Bad Air is just as destructive in its effects as bad light. Yet it is just as easily corrected—and at little if any greater cost—by installing American Blower Electric Ventilation.

The American Blower Company offers you the services of an engineering and manufacturing organization that has been serving every branch of industry for 46 years. We will gladly furnish data relative to the influence of American Blower Electric Ventilation on *your own* business.

Just mail the coupon—or ask your electrical dealer or heating and ventilating contractor.

AMERICAN BLOWER CO., DETROIT
Branch Offices in All Principal Cities
Canadian Sirocco Company, Ltd., Windsor, Ont.

Frequency of Air Changes Necessary for Various Applications*

Offices	5 to 10 minutes
Toilets	3 to 5 minutes
Bakeries	3 minutes
Cabins	5 minutes
Tunnels	1 to 10 minutes
Projecting Booths	2 minutes
Laboratories	3 to 10 minutes
Conduits	1 to 10 minutes
Ship Holds	10 minutes
Kitchens (Home)	2 to 3 minutes
Laundries	5 minutes
Theatres	5 to 10 minutes
Assembly Halls	5 to 10 minutes
Garages	5 minutes
Dining Rooms	5 to 15 minutes
Machine Shops	15 minutes
Lodge Rooms	10 minutes
Foundries	5 to 10 minutes
Retail Stores	5 to 15 minutes

*This table based on climatic conditions in Central United States. Other tables for specific localities are available.

C O U P O N

AMERICAN BLOWER CO., DETROIT, MICH.

Send details relative to the application of American Blower Electric Ventilation to

(*Business*) _____

Name _____

Address _____

City and State _____ (1)

© A.B.Co. 1927)630)

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

Manufacturers of all Types of Air-Handling Equipment — Since 1881

GOOD VENTILATION IS ONLY GOOD BUSINESS

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THE MONIGHAN WALKERS
Maintain Their Certified Standard by Using
WILLIAMSPORT WIRE ROPE
Read Why



WILLIAMSPORT

maintains a standard of uniform construction and inspection that greatly adds to the life of every grade.

With only a rare exception it will give you longer and more uniformly satisfactory service than you may expect based upon an average previous performance.

The Telfax System of Factory Certification and Grade marking reduces the danger from substitution and natural mistakes to zero.

The protection you get from using Williamsport, a wire rope of *known* grade and strength, is worth hundreds of times more than any slight difference in cost.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works:
WILLIAMSPORT, PA.

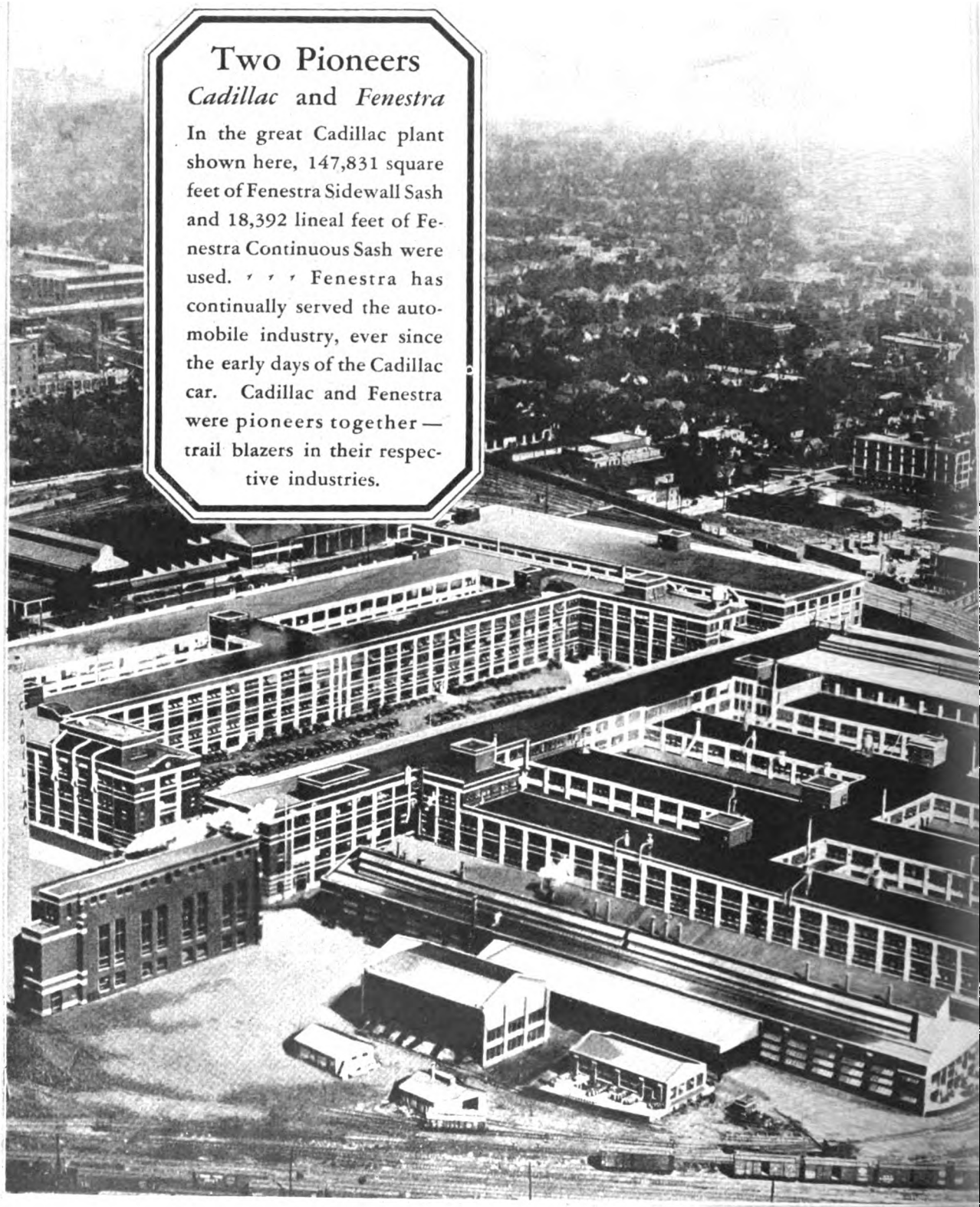
General Sales Offices:
PEOPLES GAS BLDG.,
CHICAGO

Use MADESCO TACKLE BLOCKS—*They Stand the Gaff*

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Fenestra WINDOWALLS

DETROIT STEEL PRODUCTS COMPANY, 2305 EAST GRAND BOULEVARD, DETROIT, MICH. FACTORIES: DETROIT, MICH., OAKLAND, CALIF., AND TORONTO, ONT., CA

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435—Wall Paint Brush. Long Black China Bristle heavily filled and vulcanized in hard rubber—nickeled ferrules. Size 3″ to 5″ widths.

The Mark of a Better-Wearing Brush

For painting and varnishing, there is an Osborn Brush—especially designed and built for each particular job—that will do it better and wear longer.

Osborn's 30 years' experience in the designing and building of fine brushes is readily apparent to every man who knows a good brush when he sees it.

The sure way to tell better-wearing and better working brushes is to look for the Osborn trademark.



444—Flat **Varnish** Brush. Black **China** Bristle, vulcanized in hard rubber—**chiseled.** Tin ferrules. **A handy** brush for general use. Size 1″ to 4″ **widths.**



401—**Flat Varnish** Brush. **Black China** Bristle, **vulcanized in** hard **rubber, triple** thick, **chiseled. Nickel**ed ferrules—**cherry** handles. **A popular** high-grade **brush.**



441—**Oval Paint or Varnish Brush, Black China Bristle, vulcanized in hard rubber—chiseled. Nickeled ferrules. Size 1⅛″ to 2⅛″ diameter.**

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Avenue Cleveland, Ohio
Branch Offices:
New York, Detroit, Chicago, San Francisco, Los Angeles

Osborn Brushes

BETTER WEARING BRUSH FOR EVERY USE

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Tapping one of the seven and a half million trees in cultivation on the United States Rubber Company Plantations in the Far East

Rubber manufacture today begins at the tree

The United States Rubber Company is the largest single producer of crude rubber in the world.

Every pound of rubber that comes from our great plantations in Sumatra and Malaya is treated from the time it leaves the tree with a distinct view to the type of product into which it will be made—and the service which that product must perform.

In 1911 we started our own plantations in Sumatra, Dutch East Indies. Today, the United States Rubber Company operates the largest rubber plantation in the world, with over seven million trees in actual cultivation.

A recent report by Herbert Ashplant, noted rubber authority and Government Rubber Mycologist of Southern India, states:

> *"Of all the rubber areas visited none produced so much unus information as the Plantations of the United States Rub Company in Sumatra. Kisaran, headquarters of these plan tions, has become the Mecca of all planters who wish to k abreast of recent rubber research."*

Trade Mark

United States

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We have been growing rubber on our own plantations for fifteen years. Today, the finest rubber produced anywhere in the world goes into the products carrying the famous "U. S." trade mark. For example—

"U. S." Mechanical Rubber Goods for every industrial need

The United States Rubber Company has been manufacturing Mechanical Rubber Goods for over seventy-five years. From coast to coast in every field of industrial activity, the "U. S." trade mark is recognized as a guarantee of maximum service. The "U. S." Line of Mechanical Rubber Goods is the most comprehensive line of its kind on the market.

Belting for Transmission, Conveying and Elevating

United States Rubber Company, by careful and intensive arch, has perfected compounds to meet all phases of belt ice. Whether the belt must operate in zero temperature treme heat, in dry atmosphere or damp, subject to cor- e chemicals or the abrasive wear of sharp-edged materials "U. S." Rubber Belt is built to meet the service.

wish to emphasize the importance of installing the right ng in the right place. Whatever may be the peculiarities e drive, there is a "U. S." Belt particularly designed to our need.

Hose for Every Industrial Need

ave given special attention to the development of a com- line of hose for every industrial need. Whatever your requirements may be, you will find a "U. S." Hose suited ur needs. Included in the "U. S." Line are hose for the ving services: acid and pneumatic tool, auto radiator, ical, coke, creamery, fire and mill, gasoline, garden, filling n, oil, oxy-acetylene, sand blast, spray, steam, water on, vacuum and many others.

Packings for Every Type of Service

pressures and high temperatures—the continual strain reased industrial activity in every field—all of these have combined to place greater responsibility and importance upon packings of all styles.

United States Packings are the perfected result of years of experience. To standardize on the "U. S." Line of packings means an assurance of always getting maximum service and uninterrupted operation from your engines.

Miscellaneous

For years the United States Rubber Company has led the world in the development and improvement of Mechanical Rubber Goods. Every new development is backed by a thorough knowledge, practical and technical, of the particular working conditions to be encountered in the new field. No matter what industry you are in or where you are located, the United States Rubber Company is prepared to supply you with equipment in the Mechanical Rubber line that will materially increase the efficiency of your plant.

Sales Branches Equipped for Service

Whatever your Mechanical Rubber requirements may be—whether it is a question of conveyor belt or a length of hose, a hard rubber container or a specially molded article made to your specifications—our sales branches are equipped for real service. They are operated by men who are experts on Mechanical Rubber Goods and understand the requirements of practical operation. Their advice is at your disposal. You will find it valuable.

United States Rubber Company

Head Offices: 1790 Broadway, New York City

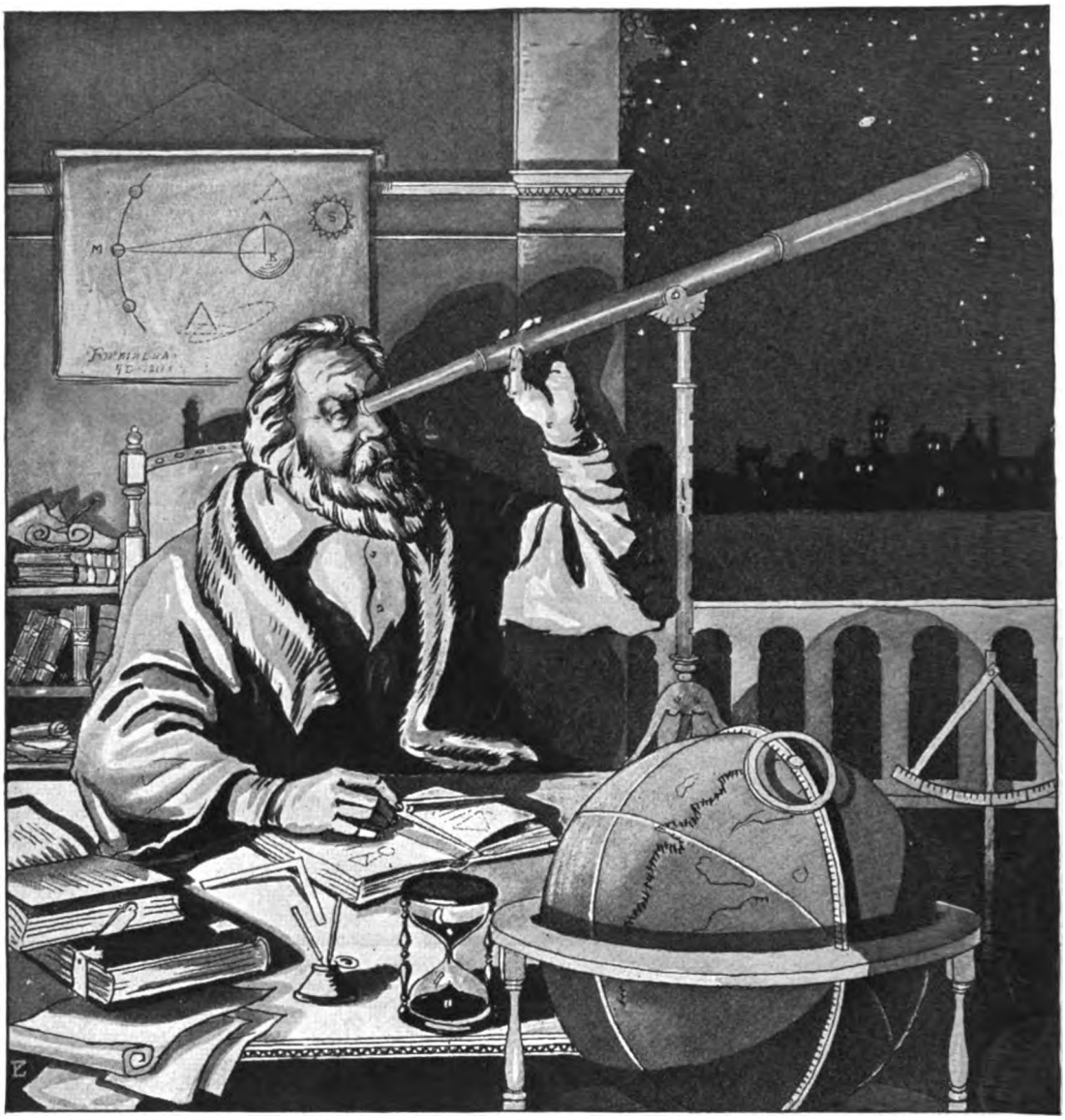
Sales offices in thirty-five principal cities in this country
Also sales offices in leading industrial centers of the world

bber Company

Trade Mark

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"ONE THING WELL DONE"



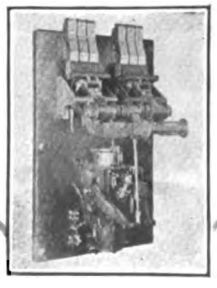
Galileo — greatest astronomer and mathematician of all time—set before himself a rigid standard of devotion to one purpose: a lifetime of study of the solar system and its infinite mysteries. His remarkable discoveries and calculations are the foundation of all modern astronomy.

Establishing the principles of a modern science—ELECTRICAL PROTECTION—has been Cutter's sole enterprise since 1888. There can be no gainsaying the fact that I-T-E Circuit Breakers have introduced—throughout the past 40 years—a measure of safety, security and electrical economy that has become a recognized standard throughout the realm of industry and commerce.

"The Circuit Breaker Art of the World is what we have made it."

CUTTER

A 6000 Ampere, 250 volt, 2-pole overload, solenoid operated I-T-E Air Circuit Breaker installed in the Chicago steel district. Equipped with Auto-Ite, or mechanical non-closable-on-overload feature to protect equipment and employees and to guard against production delays.



The "Handbook of the I-T-E Circuit Breaker"—with its 263 pages of text, tables, charts and illustrations on electrical protection—is worth having. Your copy will be mailed free on request.

THE CUTTER COMPANY, EST. 1888

505 N. 19th STREET—PHILADELPHIA

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HE was a small manufacturer of electric dryers, who one day found himself without a source of supply for motor parts and windings. The people from whom he had been buying suddenly abandoned motor manufacture as an unprofitable sideline; they cut him off with little notice and with scant consideration.

But his was a "going" business. He needed motors, and he needed them quick. So he brought his problem to Domestic.

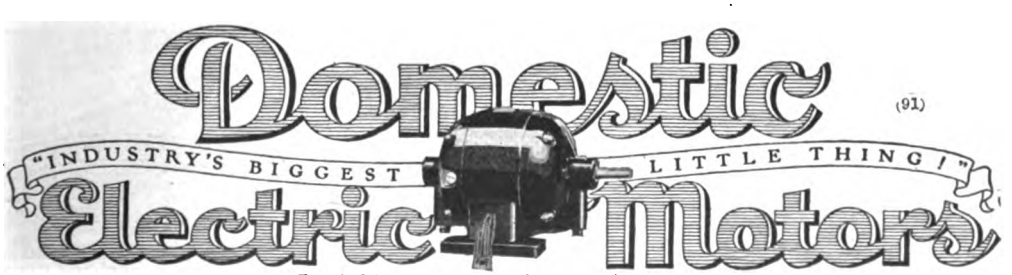
Overnight, our engineers worked out a complete universal type motor, specially designed for his needs. Within 45 days deliveries began—and another manufacturer was saved from business embarrassment.



Between Dusk and Dawn
—we found his answer for him!

Many appliance manufacturers, whose volume is small but whose requirements are highly "special", face what seems to be a difficult motor problem. Yet they need not accept "stock" motors that do not fully meet their appliance specifications; nor need they turn to unreliable or impermanent sources of supply. Perfect motor application with us is a creed. The building of lasting connections with successful concerns is our one aim in business. Manufacturers in a score of household, commercial and industrial fields are today sharing the advantages of experience, flexibility and close personal contact in their dealings with an organization that works as a department of every client's business. A line of inquiry will bring full information regarding our service as applied to any fractional horsepower motor problem.

THE DOMESTIC ELECTRIC COMPANY
7209-25 St. Clair Avenue CLEVELAND, OHIO



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Job-lot wrenches *vs* standardized line

THE danger in buying job-lot wrenches is manyfold. Often imperfect, unwarranted and amounting to little less than a collection of misfits, they prove far more expensive than the best known wrenches you can purchase.

The wise buyer insists on a standardized line, backed by a reliable manufacturer, and he finds it in WILLIAMS' SUPERIOR CARBON STEEL WRENCHES.

A single line of 40 patterns in about 1000 sizes, case hardened, finished in black enamel *(baked on)* and with polished heads, all fully guaranteed. Write for further information.

J. H. WILLIAMS & CO.

"The Wrench People"

NEW YORK BUFFALO CHICAGO

WILLIAMS

SUPERIOR DROP-FORGED TOOLS

SUPERIOR

Carbon Steel

DROP-FORGED WRENCHES



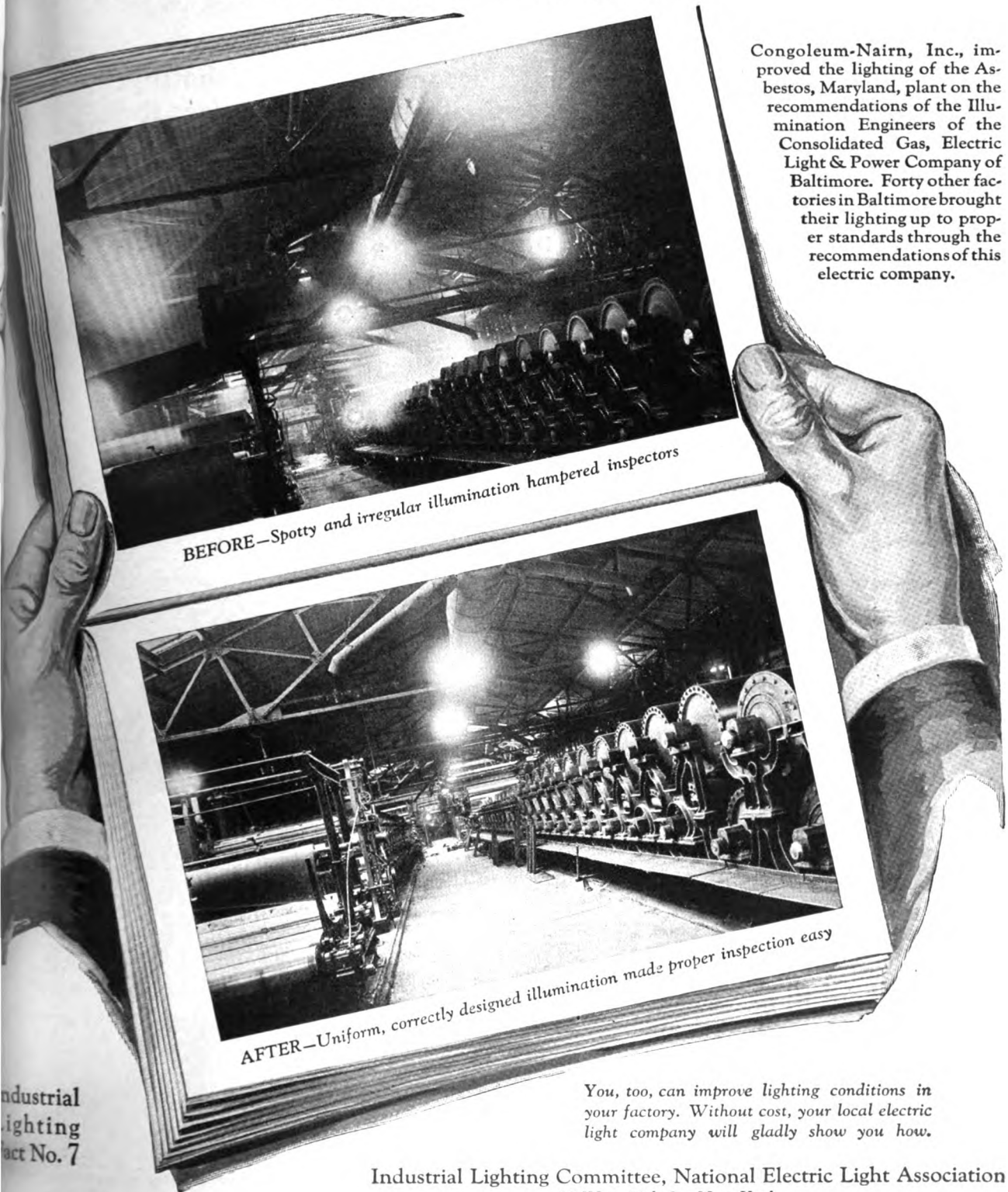
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Improved Lighting Allows Easier Inspection in Congoleum Plant

THE results from the new lighting installation in the Asbestos, Maryland, plant are very satisfactory. The illumination is uniform instead of being spotty and glaring, and the building presents a more favorable appearance. The improved system brought about little or no noticeable increase in our lighting expense.

"We feel that the results obtained under this new lighting system have more than paid for the cost of installation."—Congoleum-Nairn, Inc.

Over 15,000 factories which changed their lighting last year have obtained the same satisfactory results in working conditions.



BEFORE—Spotty and irregular illumination hampered inspectors

AFTER—Uniform, correctly designed illumination made proper inspection easy

Congoleum-Nairn, Inc., improved the lighting of the Asbestos, Maryland, plant on the recommendations of the Illumination Engineers of the Consolidated Gas, Electric Light & Power Company of Baltimore. Forty other factories in Baltimore brought their lighting up to proper standards through the recommendations of this electric company.

You, too, can improve lighting conditions in your factory. Without cost, your local electric light company will gladly show you how.

ndustrial
ighting
act No. 7

Industrial Lighting Committee, National Electric Light Association
29 West 39th St., New York

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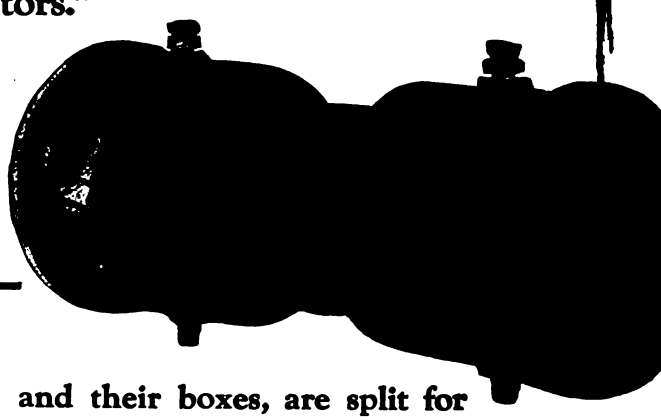
Paid for themselves in *six month*

"Our business has expanded rapidly for the past two or three years, and last summer we found ourselves at the limit of our resources in regard to the power that we were able to get out of our turbine water wheel,—and still two large printing presses to be added.

"We were running four long lines of 2 3/16" shafting with 29 bearings. We finally decided to replace the plain bearings with Hyatt Roller Bearings. We have now used the roller bearings for six months. The result has more than met our expectations. We were able to gain enough power to operate the two presses and it is our opinion that we still have some power in reserve. There is no doubt but that we have saved the cost of the bearings in the six months that they have been in operation.

"There was the added advantage of being able to make the change on very short notice, and at a trifling expense as compared to the installation of an engine or electric motors."

Excerpt of letter from
The Diepress Company, Inc.
Cazenovia, N. Y.



THIS experience is typical with Hyatt Line Shaft Bearings. Hyatts give many years of this same dependable, frictionless, low-cost service — constantly saving 15% on power bills, and materially cutting maintenance cost. The bearings, and their boxes, are split for quick installation — without disturbing the shaft fittings. Why not profit by their efficiency now?

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Worcester Philadelphia Oakland Cleveland

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

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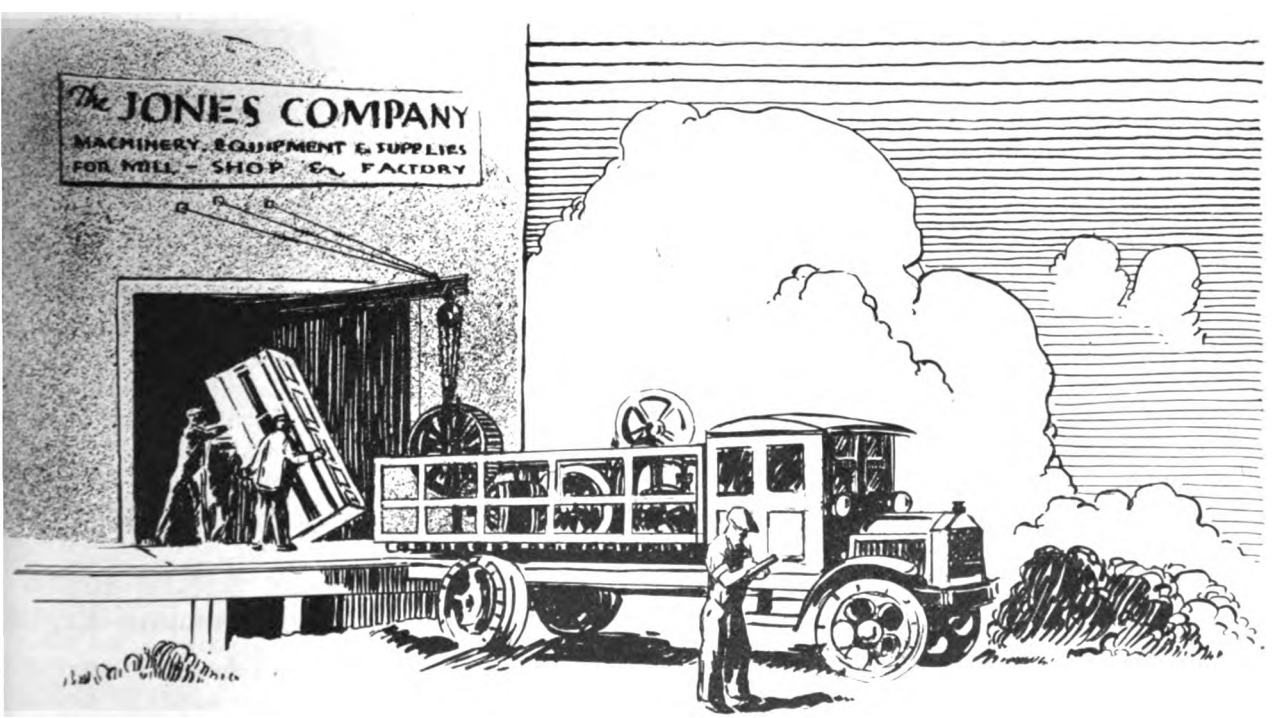
Smaller Inventories — an added Source of Profits

MANY manufacturers carry too great a stock of tools and supplies in their storerooms and warehouses. They do this for no better reason than that the practice was established during some period when deliveries were hard to make and the demand for equipment and machinery was abnormal.

But these large inventories are costly. They increase overhead costs, require added labor and expensive accounting systems, not to mention added space for storage.

Let your machinery and mill supply distributor act as the source of supply. That is what he is in business for. His service enables you to save the cost of carrying large inventories and he will deliver any of your requirements at very short notice. By dealing with the distributor, you eliminate the necessity of large storeroom space, expensive accounting systems and labor to care for all tools, equipment and supplies kept in stock.

Buy from the Machinery and Mill Supply Distributor

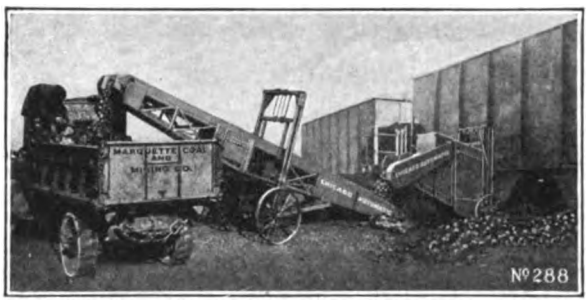


One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor

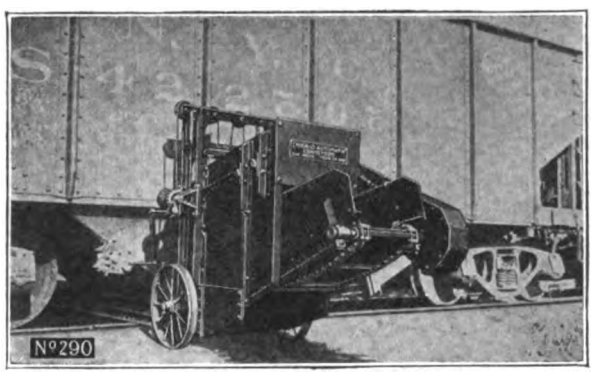
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CHICAGO AUTOMATIC

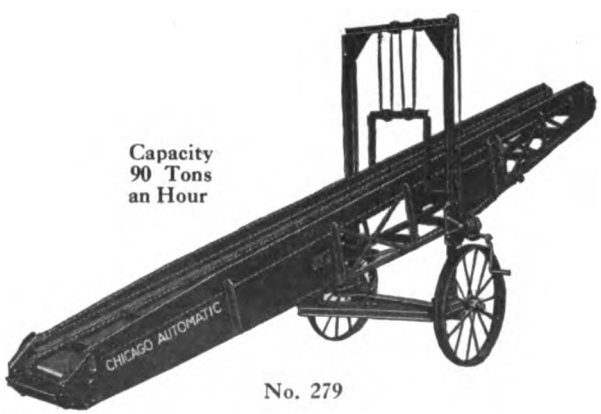
Conveyors and Track Unloaders Made Possible a Ton a Minute Car Unloading



Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use 90 tons an hour is the capacity of both machines



The Model T. U. goes under any car and handles all classes of fuel



This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable conveyor

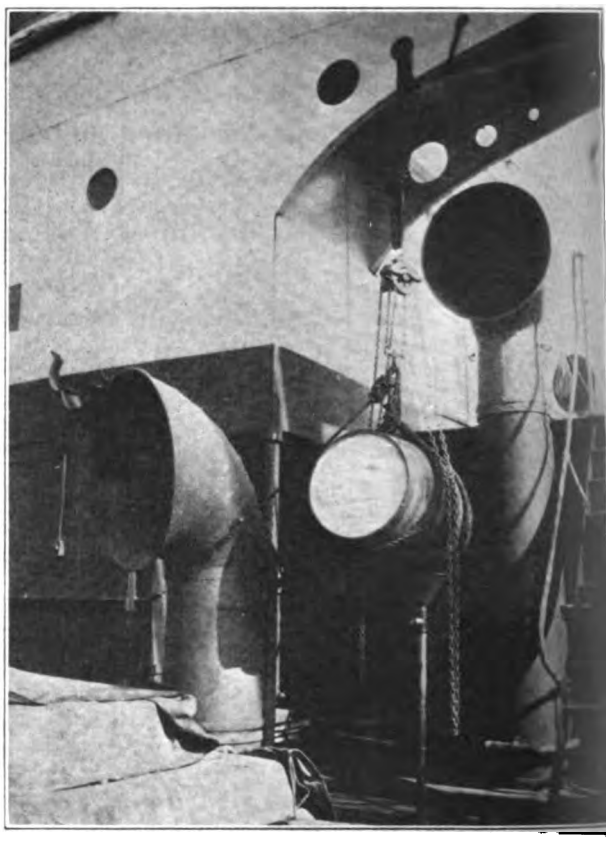
982 Old Colony Bldg. Chicago

Representatives in All Principal Cities

Novel Method for Supplying Lubricating Oil

By Charles W. Geiger

THE accompanying illustration shows a very satisfactory method that is being employed on some of the Shipping Board vessels in emptying lubricating oil from barrels into the storage tanks. This is a one-man system, and it has proven so satisfactory that it is now being used on a number of Shipping Board steamers operating out of San Francisco.



The operator merely inserts a pipe in the opening leading into the storage tanks below deck. He then inserts a funnel in the top of this pipe. A chain hoist supported from the bridge is attached to the barrel of lubricating oil by means of the usual rope barrel sling in such manner that when the barrel is raised to the proper height the end containing the faucet will be slightly lower than the other end. When the barrel has been hoisted to the proper height by the chain hoist, the faucet is placed over the funnel and then opened. The operator can then leave the barrel and go about his work and when he returns a few minutes later the oil will have been emptied from the barrel.

Muffler for the Gasoline Engine

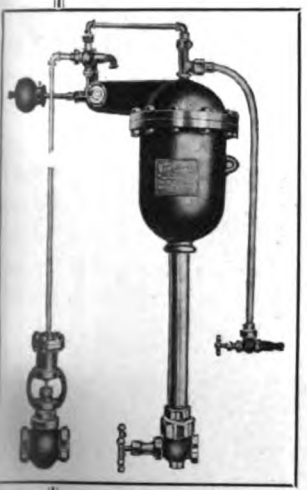
THE barking, snapping exhaust of a gasoline motor is quite annoying if no means of muffling it are provided. The accompanying illustration shows a simple effective method of muffling this exhaust.

A 30 gallon wooden barrel has a number of small holes bored through the staves in one end. A small

For articles not advertised in this issue write Industry Illustrated

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Is Your Boiler Accident-Proof?



The experienced power plant engineer knows that a constant water level in boilers is essential to safety. So he uses the

VIGILANT
Feed Water Regulator

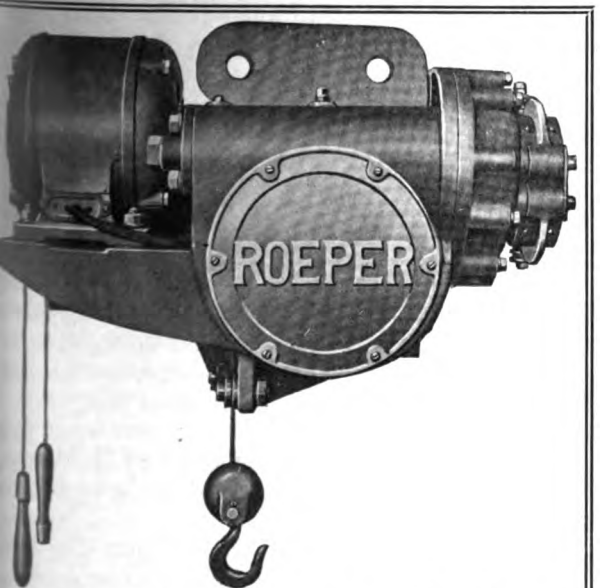
It eliminates careless hand feeding, and assures a constant water level. Boiler strain is reduced and safety secured.

A constant water level also means increased steam production and real fuel economy.

Try a Vigilant—or ask the opinion of those who use them.

Catalogue on request

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh, Pa.



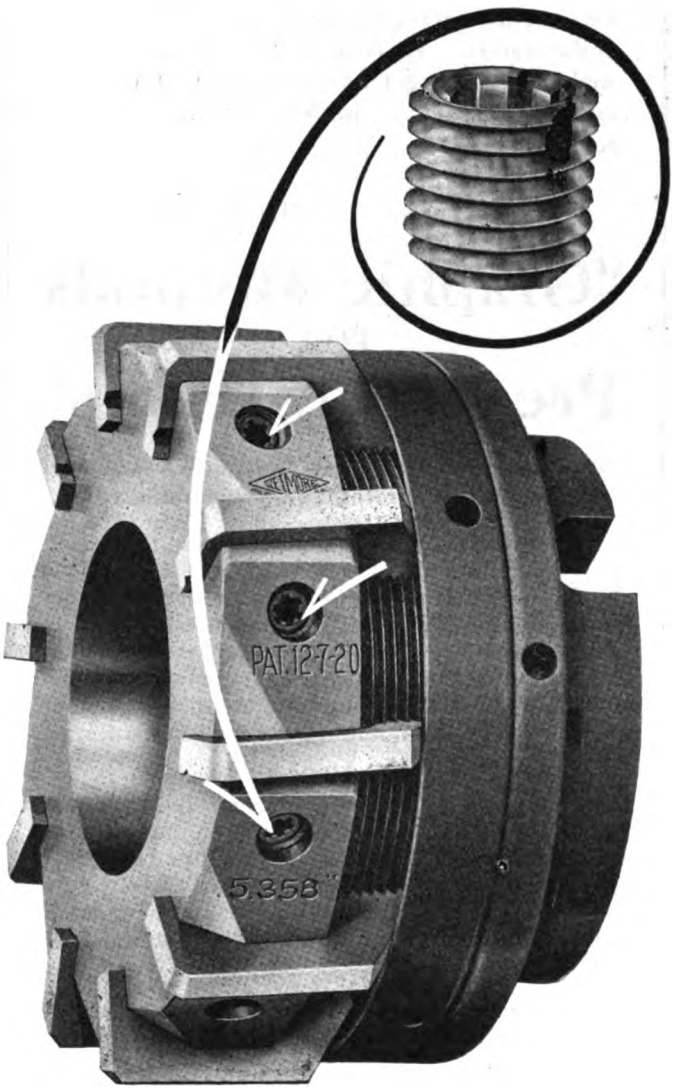
ROEPER Electric Hoists
with
Steel Plate Suspension

Two wrought steel plates in which drum shaft has its bearings, project above hoist, and can be extended and shaped to meet any requirement.

Write us for more details

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
Traveling Cranes Electric Hoists Trolleys

In Wetmore Reamers— *Bristos Hold!*



Here is a job that demonstrates the holding capacity of Bristo Safety Set Screws. A positive set on the blades of an adjustable reamer is of vital importance. The makers of an extremely accurate reamer like the Wetmore could not afford to use any but the most dependable set screws.

Bristos set tight, hold their set and can be removed without damage, because they have the most effective socket design in use today. This is an exclusive Bristo feature. Write for new catalog, CE-819, with complete information about Bristo Set Screws and Cap Screws. The Bristol Co., Waterbury, Conn.

BRISTO Safety SET SCREWS

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Put them into Pictorial form. The Chart is the one Universal language, which every man understands. It is a great timesaver. It enables you to get across what you want to say interestingly, quickly, accurately and persuasively.

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1-II-5

is then dug just under the end of the exhaust pipe and this barrel is implanted in the earth with about half its length in which the small holes were bored protruding. The exhaust pipe is then turned down over this barrel and the end inserted through a hole bored through the upper head. Thus the vibration and sound waves produced

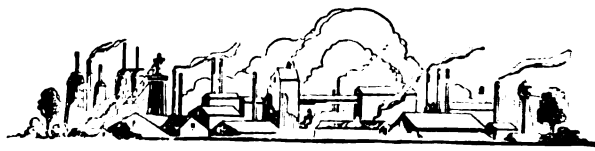


by the engine exhaust within this barrel, the pipe extending to within a few inches of the lower end, are partly absorbed by the earth and the wood cover position of the barrel muffler. A soft purring is result from a motor that previously barked very loud and was a nuisance.

Safety-First Work Bears Fruit

THE safety campaign in the iron and steel industry is proving highly effective, according to a statement issued by the United States Department of Labor. Since 1913, in plants where continuous safety work has been carried on, the reduction in accident-frequency has been about 86 per cent., as compared to 15 per cent. in plants where no particular stress has been laid upon safety.

Statistics of accidents over a 16-year period up to 19 show a gradual decline in accident-frequency during the time. Figures covering a group of iron and steel plants in which safety work has been encouraged indicate that the accident ratio for every 1,000,000 hours of workmen exposure was cut from 60.3 in 1913 to 8.2 in 1925. The group included establishments contributing approximately one-half of the output of the industry.



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Saving Time and Money

Switch engines aren't always handy and there are many times when a traffic delay is costly. Car moving at such times becomes a problem. It's then that an Advance Car Mover can save you time and money.

You'll see how rapidly your worst shipping difficulty will end with the purchase of a good reliable car mover. There's a satisfaction in the New Badger that can be proved only by use; an investment that can be proved only by time.

THE ADVANCE CAR MOVER CO.
Appleton, Wis.

New Badger
SLIP PROOF CAR MOVERS

Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912

of INDUSTRY ILLUSTRATED, published monthly, at New York, N. Y., for April 1, 1927.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared John R. Dunlap, who, having been duly sworn according to law, deposes and says that he is the Editor of the INDUSTRY ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, The Engineering Magazine Co., 381 Fourth Avenue, New York, N. Y.

Editor, John R. Dunlap, 381 Fourth Avenue, New York, N. Y.

Managing Editor, none.

Business Manager, Harvey Conover, 381 Fourth Avenue, New York, N. Y.

2. That the owner is: The Engineering Magazine Co., 381 Fourth Avenue, New York, N. Y.; John R. Dunlap, 381 Fourth Avenue, New York, N. Y.; J. R. Dunlap, Jr., 381 Fourth Avenue, New York, N. Y.; John H. Van Deventer, 381 Fourth Avenue, New York, N. Y.; Harvey Conover, 381 Fourth Avenue, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

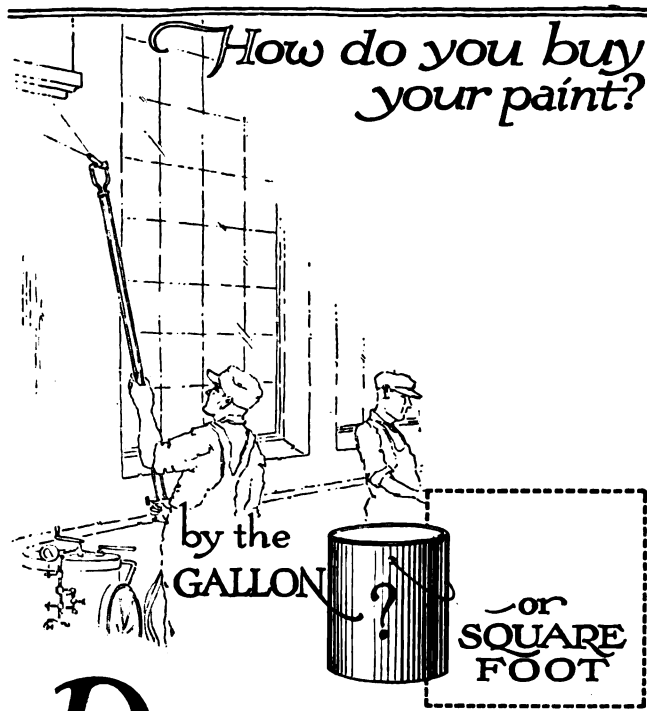
4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN R. DUNLAP.

Sworn to and subscribed before me this 4th day of April, 1927.

JEROME B. MCEVILY.

(My commission expires March 30, 1929.)



Paint APPLIED is the Real test

BUY most any paint on a gallon price basis and the big question of cost—application—is still before you.

Buy Vorcolite and your application cost is automatically cut to the lowest possible point, because with this purchase we loan you Vortex painting equipment with which your own handy man can put it on the wall.

There is no better paint than Vorcolite and none so perfectly adapted to gun application. No other painting equipment covers large surfaces half so fast as the Vortex equipment, nor so well, nor with such freedom from cumbersome ladders and planks. By no other means can a surface be covered so perfectly in a single application.

Equipment furnished without cost

Send for the Vortex check sheet, as a first step toward buying your paint on a square foot basis. It will aid you in facing your painting problem fairly and squarely.

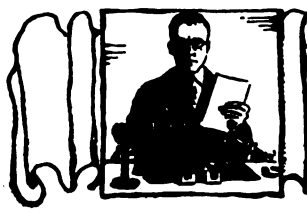
THE VORTEX MANUFACTURING CO.
1977 West 77th Street · · · Cleveland, Ohio

Vorcolite

and the VORTEX PAINTING METHOD



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WHERE to PURCHASE MODERN EQUIPMENT

for Mill Shop & Factory

BEARINGS

To readily find display advertisements describing these products turn to index on page 118.

Oilless Bearings—Bearings that give years of service without wearing and cut manufacturing costs are described by The Arguto Oilless Bearing Company.

Bearings—Certified surveys that give full details of savings are to be had from the SKF Industries, Inc.

Ball Bearings—"Ball Bearing Application to Special Ma chinery" is the name of an interesting booklet to be ha from The New Departure Manufacturing Company.

Roller Bearings—Split for quick installation—without di turbing the shaft fittings. Hyatt Roller Bearing Com pany.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.

To readily find display advertisements describing this equipment turn to index on page 118.

Motors—Should any motors have a compensator today? For the answer, write The Triumph Electric Company.

The latest achievement of The Master Engineers is described by The Master Electric Company.

A motor so equipped with ball bearings that the life of it is greatly prolonged. Write for bulletin to Valley Electric Company.

A motor equipped with Timken Roller Bearings that can be started by any approved single throw switch. Howell Electric Motors Company.

Specially designed motors for particular jobs. The Domestic Electric Company.

A motor with the reputation for excellent operation an dependability. General Electric Company.

Portable Electric Lights—Bulletin 501-S, describing all th uses of the Reelite cable is offered by Appleton Electr Company.

Welding—A new treatise on Arc Welding. The Linco Electric Company.

Circuit Breakers—that insure safety, security and electric economy. Send for the handbook of the I-T-E Circui breaker. The Cutter Company.

Lighting—For Industrial Lighting Fact No. 7, see the Indu trial Lighting Committee, National Electric Light Asso ciation.

MAINTENANCE

To readily find display advertisements describing this equipment turn to index on page 118.

Spray Equipment—Lowering the maintenance cost by the use of a spray outfit. Binks Spray Equipment Company.

A paint and lacquer spray that saves 80% in costs. The Alexander Millburn Company.

That saves three-quarters of your inside and outside painting costs. Mellish-Hayward Company.

Paint—Absolutely waterproof and weatherproof. American Asphalt Company.

Briten-All, an economical, lasting white finish. The Eclipse Paint & Mfg. Co.

The Vortex Painting Method is described by The Vortex Manufacturing Company.

Red Lead Paint that can be used as a priming or finishing coat. Goheen Corporation.

Guarantee to Remain White Longest. Write for booklet "More Light." U. S. Gutta Percha Paint Company.

Waterproofing—Samples of colorless waterproofing are offered by L. Sonneborn Sons, Inc.

Fans—that insure a positive change of air. Send for descriptive bulletin Diehl Manufacturing Company.

A man cooling fan that increases production is described in circulars offered by Robinson Ventilating Company.

Window Cleaners—that clean safely and quickly is descri by The Gerson Stewart Corp.

A trial offer of two gallons of cleaning fluid is made the Ever-Glow Company.

Industrial Doors—If you have a door problem, write Ri ards-Wilcox Mfg. Co.

Cleaning Material—Industrial Cleaning Materials and Me ods are described by The Oakite Products, Inc.

Brushes—Thirty years of experience in the designing a building of fine brushes. The Osborn Mfg. Co.

Water Tanks—An elevated tank that assures fire protecti Write for booklet. Chicago Bridge & Iron Works.

Ladders—A ladder that cannot tip, collapse, sway, slide wobble is described by The Dayton Safety Ladder C

Floor Patcher—that hardens in 48 hours. The Master Bu ers Company.

Lights—Where and when needed are described by T American Fixture Company.

Buildings—that resist corrosion and make the first cost last. Maryland Metal Building Company.

Blowers—A blower that raises the efficiency of the work American Blower Company.

Window Walls—Detroit Steel Products Company.

MATERIALS HANDLING

To readily find display advertisements describing this equipment turn to index on page 118.

Overhead Carriers—A Mono-Rail System that effects big savings in time, equipment and labor. The American MonoRail Company.

A Mono-Rail System is described in a new booklet just off the press, entitled "Materials Handling." The L den Company.

A Duo-Rail System that conserves space, speeds p

(*Continued on page* 112)

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This view shows one of many private offices of a large manufacturing company, ventilated by means of Diehl exhaust fans.

DIEHL EXHAUST FANS

Diehl quiet operating exhaust fans are used by industrial and commercial companies to obtain a constant supply of clean, fresh air for private offices.

Doors and windows can be kept closed in winter or summer for Diehl exhaust fans provide the means of securing positive change of air.

Send for descriptive bulletin—now.

DIEHL MANUFACTURING CO.
ELIZABETHPORT, N. J.
ATLANTA BOSTON CHICAGO NEW YORK PHILADELPHIA

DIEHL

ESTABLISHED 1888

We Originate and Build.

Strand
FLEXIBLE SHAFTS

Twenty-Two Years in This Industry

ESTABLISHED 1905

Flexible Shaft Equipments

Are known the world over for their Strength and Durability

Type M 7-1 H.P.



We Build Many Types and Sizes

Originators of the Three Speed Motor Counter Shaft

Capacities from 1/10 to 2 H.P.

Send for Catalog

Manufactured by

N. A. STRAND & CO.

5001 No. Lincoln St. Chicago



BAND SAWS

With Teeth as Keen and Strong as

LENOX WOLVES

You can hardly realize what keen teeth band saws can possess and the length of service they can give until you have tried LENOX Band Saws.

LENOX Band Saws live up to the reputation established by their namesakes, the savage bands of LENOX wolves who spread terror throughout the country inhabited by the fearless little Clan MacFarlane—established by the old Earl of Lenox along the Western shores of Loch Lomond.

Like the Lenox wolves of old, LENOX Band Saw Blades go through the toughest metal with a cut as straight, even and clean as the teeth of those wolves.

Try LENOX Band Saws and note the difference in cutting qualities, longer life and speed.

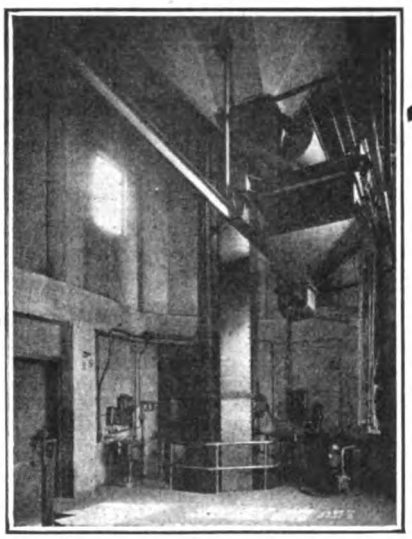
"The Tools in the Plaid Box"

AMERICAN SAW & MFG. CO.
Springfield, Mass.

LENOX
Band Saws

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Labor costs in handling coal reduced 97%



Here is another specific instance of great saving through the installation of Weller Coal Handling Systems.

The illustration shows part of Weller coal handling equipment in the boiler room of the Fairview Pumping Station, Detroit, Michigan, which reduced labor costs more than 97 per cent.

Trucks dump the coal into a hopper, level with the ground, from the bottom of which a drag conveyor conveys the coal to a Weller Coal Crusher, thence by bucket elevator to coal bunkers from which it is fed to a Weller weigh larry by gravity, weighed and fed to the stokers as required.

WELLER builds a complete line of Elevating, Conveying and Power Transmitting Machinery.

WELLER MANUFACTURING CO.
1820-1856 N. Kostner Ave., Chicago

Let WELLER *quote on your requirements*

(*Continued from page* 110)

duction, solves difficult handling problems. Write for "The Atlas of Mechanical Conveying." The Atlas-Chicago Company.

Various combinations of overhead handling systems. Chisholm-Moore Mfg. Co.

Conveyors—Reducing the cost of handling bulk or package material by the use of wood or steel apron conveyors. The Jeffrey Manufacturing Company.

That cut the cost and increase the output at the same time. Link-Belt Company.

Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company.

For eliminating handling wastes, reducing time between operations, write for "Seven Economies of Logan Conveyors." Logan Company.

Portable Cranes—A Small Portable Crane that is sent on 30 days trial is described in Catalog IN. The Canton Foundry & Machine Company. See page 118.

Pneumatic Conveyors—for handling granular material. Write for booklet 515. The Dust Recovering & Conveying Company.

Coal Handling Systems—that have reduced labor costs as much as 97%. Weller Mfg. Co.

Car Movers—A Car Mover that saves time in moving loaded and empty cars. The Advance Car Mover Company.

That move heavily loaded cars are described by The Appleton Car Mover Company.

Lift Trucks—The new extra-ton capacity K-25, three-ton High Lift Truck is described by The Yale & Towne Mfg. Co.

A lift truck designed to handle loads of any shape or size ordinarily found in the modern industrial plant. Send for the booklet "Snapshots of Sensible Saving." The Lakewood Engineering Company.

A lift truck that is absolutely stable, dependable and durable. C. A. Graham.

Electric Hoists—an electric hoist for every purpose. Shepard Electric Crane & Hoist Company.

With steel plate suspension. Roeper Crane & Hoist Works, Inc.

Casters—A folder explaining the merits of their new heavy duty casters is offered by Bond Foundry and Machine Company.

Truck Wheels and Casters—Ball bearing casters for constant continuous dependable service. Service Caster & Truck Co.

Wire Rope—of uniform construction that gives maximum protection. Williamsport Wire Rope Company.

Pickling Baskets—A corrosion resisting pickling basket manufactured by The Breese Bros. Co.

Pressed Steel Equipment—A complete line of pressed steel material handling equipment is described by The Power Pressed Steel Company.

Scales—"Weigh While You Convey," described by The Merrick Scale Mfg. Co.

POWER PLANT EQUIPMENT AND AUXILIARIES

To readily find display advertisements describing this equipment, turn to index on page 118.

Heating Pumps—For the nearest pump engineer. Nash Engineering Company.

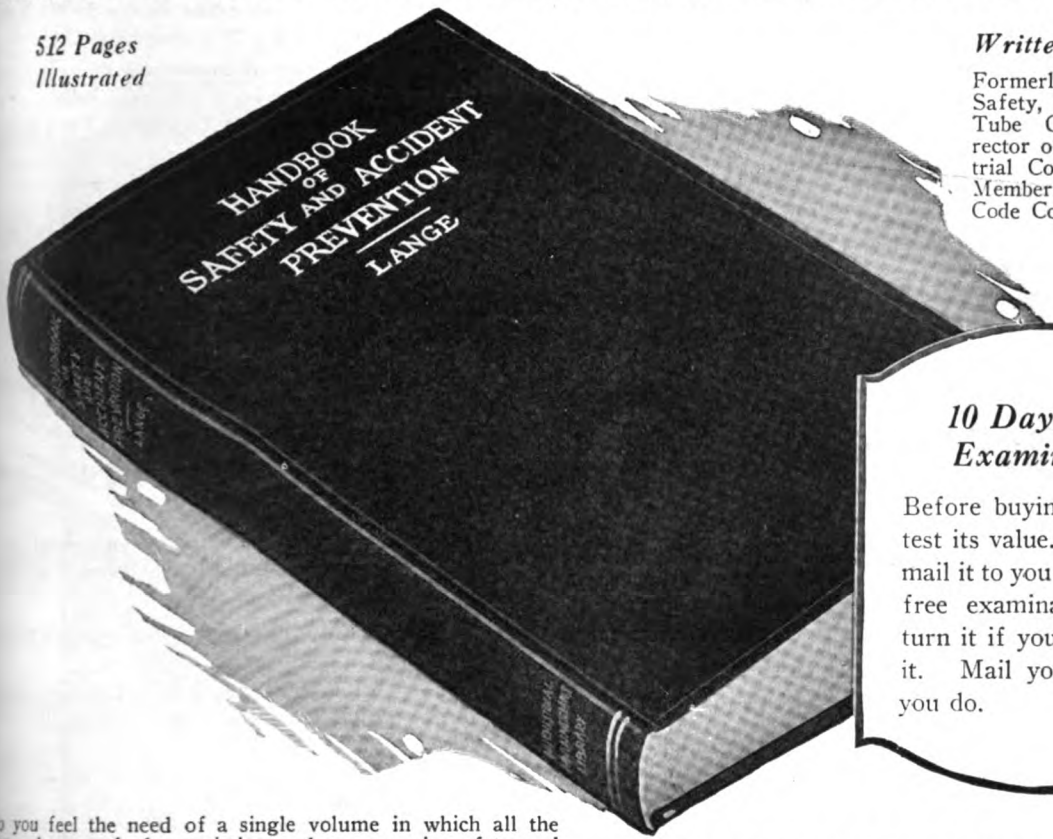
Measuring Instruments—Instruments that carry the guarantee of seventy-odd years of manufacture are described. Taylor Instrument Companies.

(*Continued on page* 114)

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HANDBOOK OF SAFETY AND ACCIDENT PREVENTION

512 Pages
Illustrated



Written by Fred G. Lange

Formerly Assistant Director of Safety, Youngstown Sheet and Tube Company; former Director of Safety for the Industrial Commission of Ohio and Member of National Safety Code Committee.

10 Days Free Examination

Before buying the book, test its value. Ask us to mail it to you for 10 days' free examination. Return it if you don't want it. Mail your check if you do.

Do you feel the need of a single volume in which all the facts, plans, methods, statistics, and progress in safety and accident prevention work are given? Lange's Handbook, just published, will answer your requirements—completely, thoroughly, and authoritatively.

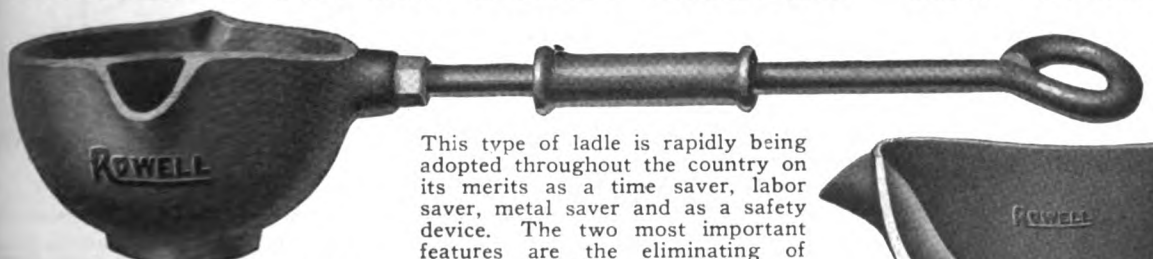
THE ENGINEERING MAGAZINE CO.
381 Fourth Avenue, New York City

MEN WANTED
with an Acquaintance Among Industrial Executives

AN opportunity for men who have sold to industrial plants or for others with a knowledge of plant practices who are looking for the chance to become salesmen. Positions open in industrial centers and good territories will be assigned. Earnings are unlimited and good future for men who make good.

The work consists of selling subscriptions for one of the best known publications in the industrial field. A magazine published for 35 years with an enviable reputation for its service to industrial executives. Men who can give only a part of their time will also be considered. Write giving an outline of your experience. Address box 535, Care INDUSTRY ILLUSTRATED, 381 Fourth Ave., New York

ROWELL BOTTOM POUR LADLES—*Self Skimming*



No loss of labor or material with ROWELL Bottom Pour Ladles as is the case with top pour ladles.

This type of ladle is rapidly being adopted throughout the country on its merits as a time saver, labor saver, metal saver and as a safety device. The two most important features are the eliminating of skimming, and the saving of metal.

Ask your dealer or write direct for Descriptive bulletins and prices.



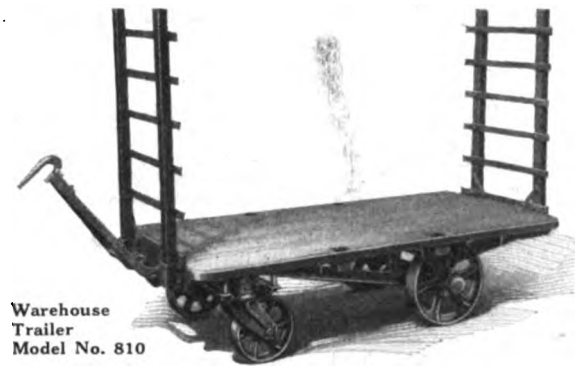
Interior View of Ladle

ROWELL MANUFACTURING COMPANY, APPLETON, WIS.

"SEE US AT THE CONVENTION"

PATENTED

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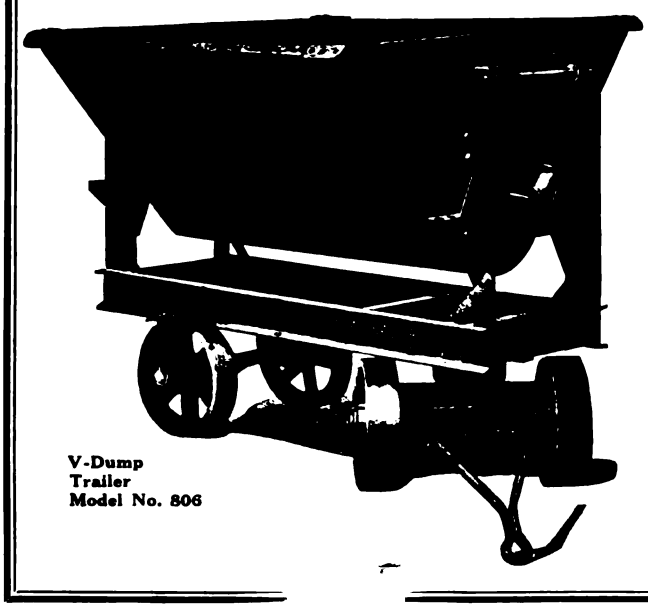
Warehouse
Trailer
Model No. 810

The Difference

The difference between Lakewood Trailers and ordinary trailers is not always apparent at first glance, but compared part for part and dimension for dimension the practiced eye sees superiorities of design and workmanship that can only be the result of a thorough understanding of trailer uses and industrial needs.

Lakewood manufactures a complete line to meet every factory requirement. Standard sizes are carried in stock ready for immediate shipment.

The
Lakewood Engineering Company
Cleveland, O.



V-Dump
Trailer
Model No. 806

(*Continued from page* 112)

Unions—A free trial offer is made by E. M. Dart Mfg. Co.

Industrial Thermometers—A complete service by the Engineering Staff is offered by The Industrial Division of The Moto Meter Company, Inc.

Regulators—A feed water regulator that puts boilers on an efficient basis is described in a catalog of The Chapin-Fulton Mfg. Co.

Steam Traps—Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving maximum heat from steam used. Write for Bulletin 133. Illinois Engineering Company.

Eliminating waste in the steam line. A "Sarco" is sent on 30 days free trial. Sarco Co., Inc.

TRANSMISSION EQUIPMENT (Including Belting)

To readily find display advertisements describing this equipment turn to index on page 118.

Flexible Shaft Equipment—Cost cutting uses for flexible shaft equipment is offered in picture-story form by R. C. Haskins Company.

Known the world over for its strength and durability. N. A. Strand Company.

Speed Reducers—A catalog describing The Lewellen Transmission for varying speeds is offered by Lewellen Mfg. Company.

With Timken tapered roller bearings. Send for the speed reducer bulletin. R. D. Nuttall Company.

A ball bearing force-feed lubricated speed reducer that has an efficiency of over 96%. Reeves Pulley Company.

Belting—that lasts longer is featured by Chas. A. Schieren Company.

For transmission, conveying and elevating. United States Rubber Company.

"How, When and Where," to buy Burmaline Belting. A treatise on belting. Burrell Belting Co.

Belt Treatment—that keeps the belt as tight as a fiddle-string. Cling-Surface Company.

A Belt Lacer—combining the dominant features of speed, power ease of operation. Clipper Belt Lacer Company.

Clutches—that prolong the life and increase the working capacity of any machine. Twin Disc Clutch Company.

The New Conway Disc Clutch and its ten salient features are shown by Conway Clutch Company.

Couplings—Catalog No. 43 describes everything in line shafting equipment. The Medart Company.

Gears—Catalog No. 30 tells the story of Jones Industrial Gears. W. A. Jones Foundry & Machine Company.

Pulleys—Pressed steel pulleys and hangers that are light, rigid, efficient and adjustable. Write for your copy of "Worthy Companions." The American Pulley Company.

TOOLS (Shop Tools, Saws, Files, Chucks, etc.)

To readily find display advertisements describing this equipment turn to index on page 118.

Drills—For high speed drills see The Standard Tool Co.

A free trial offer of a Thor Electric Drill for thirty days is made by the Independent Pneumatic Tool Company.

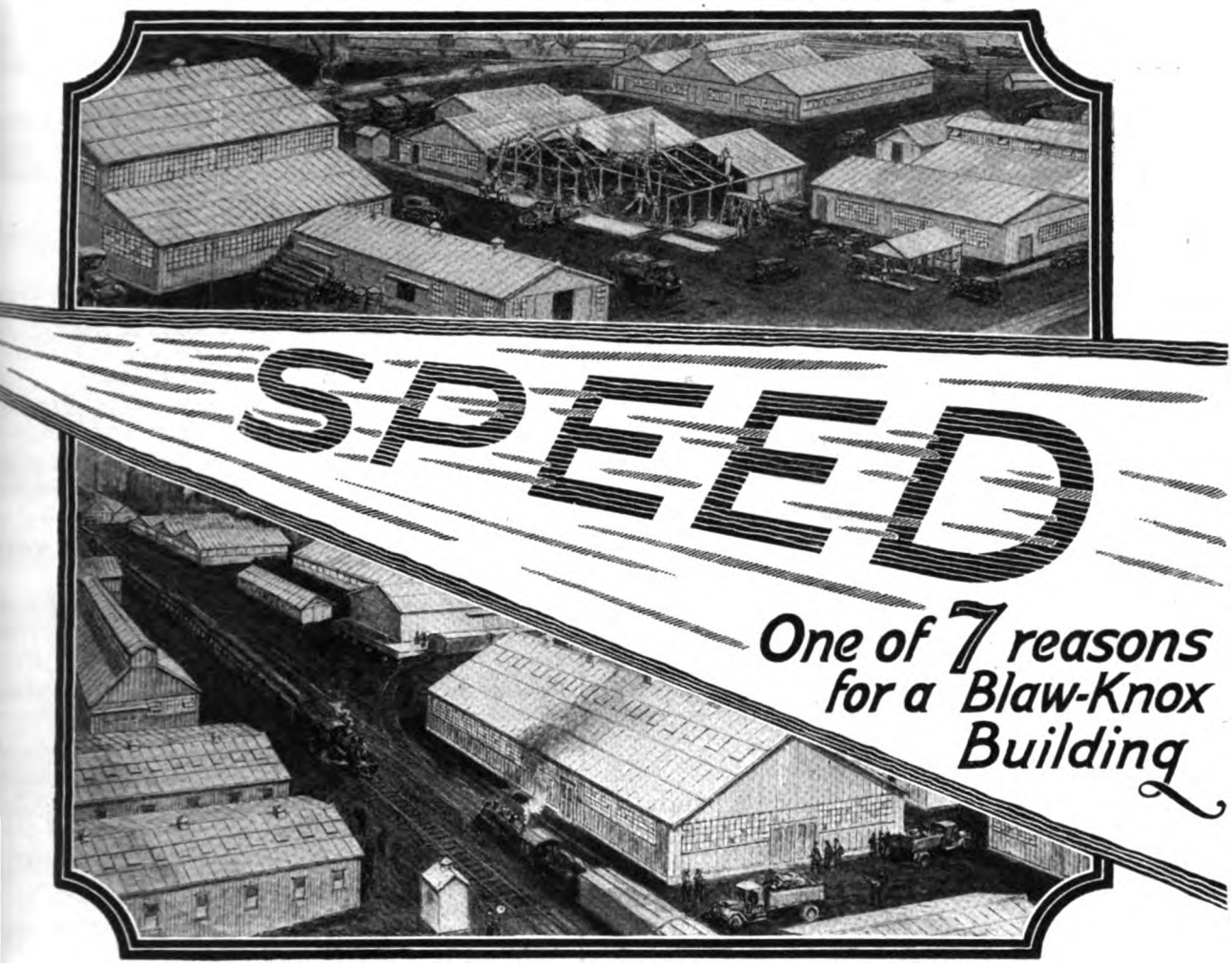
The six famous twist drills are described by The Cleveland Twist Drill Company.

(*Continued on page* 116)

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BLAW-KNOX STANDARD BUILDINGS



The plant of the David R. Kennedy Company, Inc., New York City, manufacturers of floor tiles, etc., burned down, with contracts in work on which delivery was imperative. In this emergency Blaw-Knox Standard Steel Buildings were rushed to the site—and in a remarkably short time production was resumed and contracts were being filled.

The first Blaw-Knox Building was delivered before foundations were ready (one week was the exact time), and the remaining buildings were on hand as soon as foundations were completed.

The Kennedy Company did not have to use valuable time in design, fabrication and erection—work usually requiring many contracts and sub-contracts and much skilled supervision. Blaw-Knox **predesigned** Steel Buildings were shipped in standard units and quickly erected with the guidance of standard erections plans which are part of the building service.

The Kennedy Company is now housed in weathertight, galvanized steel daylight factories that are absolutely firesafe and rust-resisting. Most important of all—they were enabled to fulfill their contracts.

7

Standard Building units conform to any shape, size, or style.
Save time and expense in erection.
Lowest cost per year.
10 year roof insurance.
Copper-bearing, galvanized Steel construction.
Firesafe.
Rust-resisting.

BLAW-KNOX COMPANY
Farmers Bank Building - Pittsburgh, Pa.
Branches in All Principal Cities

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A Thor drilling holes in large steam table. This drill has ½ in. capacity. Can be had with breast plate or spade handle.

Thor

ELECTRIC DRILLS

Cut Drilling Costs in Half

Because they are light, easy to handle and powerful. They will stand hard, severe use, because they are built to withstand it. They will bite their way quickly through iron, steel or wood, and make short work of difficult jobs.

Because they are ever-dependable, being built throughout of rugged, easy-running parts and have super-power, non-stallable motors. And because they are safe—a 3 wire safety cable which prevents shocks is standard equipment.

***Thor* Electric Drills are standard in hundreds of plants, and are satisfactorily meeting the demands of daily maximum routine production. All they need is a trial and their performance will soon convince you.**

Try a Thor in your plant for 30 days on our free trial offer. Put it to the test. If you are not satisfied with its performance, return it at our expense. No obligation to you—no red tape.

TOOLMAKERS SINCE 1893

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS — GENERAL OFFICES 600 W. Jackson Blvd. CHICAGO — ELECTRIC TOOLS

FACTORY AURORA, ILL. — BRANCHES THE WORLD OVER

Eastern Office 1463 Broadway, New York. — London Office 40 Broadway, Westminster, London

(*Continued from page 114*)

Saws—Metal cutting saws for severe service and accurat work. Simonds Saw and Steel Co.

of speed, durability and accuracy that lower operatin costs are described by Gallmeyer & Livingston Com pany.

Cut costs with a Parks shipping room saw. The Park Woodworking Machine Company.

Band Saws—With teeth, keen and strong. American Saw Mfg. Co.

Saw Blades—Facilitate cutting with Victor Blades. See Vi tor Saw Works.

Wrenches—Of Chrome Vanadium Steel are described Bonney Forge & Tool Works.

Reversible Ratchet Type are shown by The Low Wrench Company.

Forty patterns in about one thousand sizes of Superi Carbon Steel. J. H. Williams & Company.

Small Tools—A Catalog listing 20,000 small tools may had for the asking. Greenfield Tap & Die Corporati

Lever Vises—Descriptive circulars of the "Pronto" qui operating and wide opening lever vises may be had fr Edw. Purvis & Son.

Tool Holders—that are being used by over 90% of all machine shops. Armstrong Bros. Tool Co.

Set Screws—Catalog CE-819 describes a new set screw m ufactured by Bristol Company.

Screws—That Facilitate Assembling. The Allen Mfg.

Portable Jointer—A jointer which will cut down labor save trucking of material is described by Heston Anderson.

Micrometers—of split hair accuracy is described by Bro & Sharpe Mfg. Co.

Pipe Machine—An ideal pipe machine for general purpo is described by The Oster Manufacturing Company.

Bolt Clippers—that can be used in awkward places. W for booklet. H. K. Porter, Inc.

Vises—with a base that locks. Send for catalog 57B. Cha Parker Company.

Bending Rolls—for vertical bending and horizontal bend Complete information on how to cut bending costs be had from Buffalo Forge Company.

Ladles—Bottom pour ladles that save time and metal assure safety. Rowell Manufacturing Company.

Grinders—and equipment are described in a new bookl also a tap drill chart. Wisconsin Electric Company.

A portable grinder with a flexible shaft. Mall Company.

Surface Grinders—Particularly efficient on a wide variet small tools. Full particulars may be had from the Salle Tool Company.

MISCELLANEOUS

Goggles—Welding and Cutting Goggles that eliminate of the injurious rays. Wilson Goggles Company.

Counters—A full line of magnetic and mechanical cou for all machines is offered by The Veeder Mfg. Co.

Colored Pencils—for making fine lines. American Lead cil Company.

Factory Furniture—Made of all-steel is described in Bul 357 of Standard Pressed Steel Company.

Mechanical Rubber Goods—for every industrial United States Rubber Company.

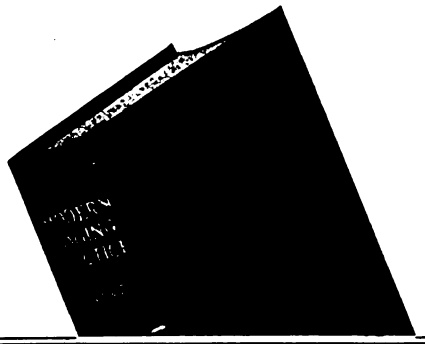
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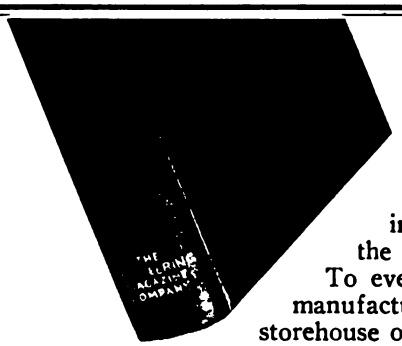
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AT OUR EXPENSE

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IV. Work Gages.
V. Inspection Gages.
VI. Gaging of Screw Threads.
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It Costs You Nothing to Test the Value of This Book

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381 Fourth Ave., New York City.

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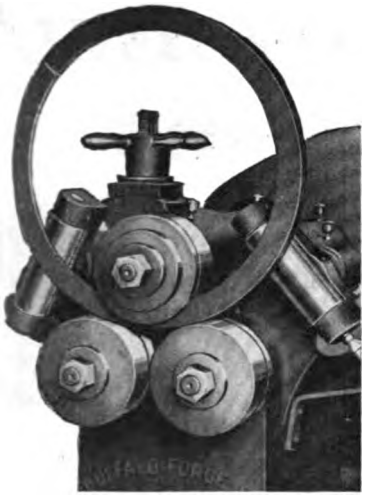
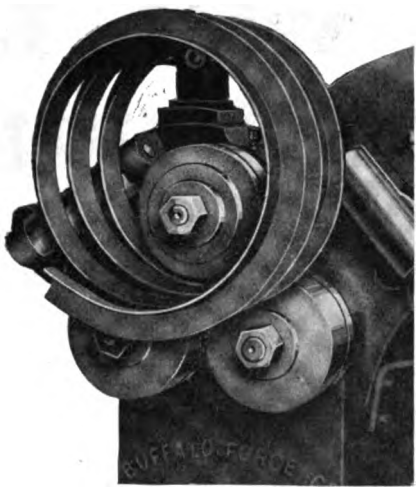
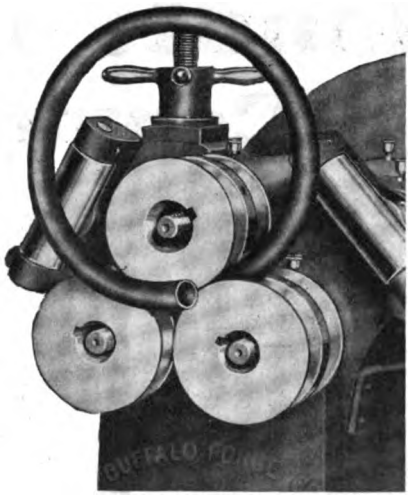
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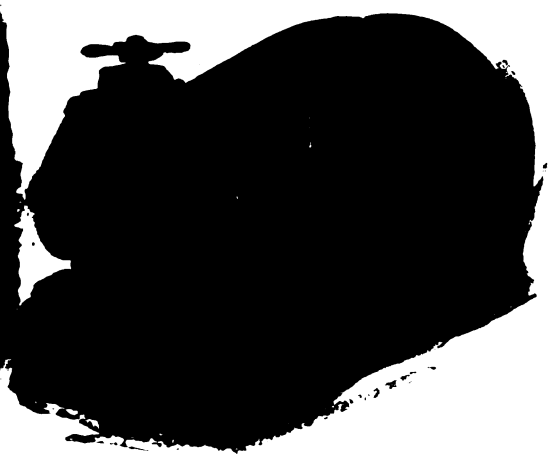
Yale & Towne Mfg. Co. .....

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Do You Bend Any of These—

Flats on edge or on flat, squares, angles and tees—leg in, angles and tees—leg out, channels and I-beams—on web or flange, copper tubes, any weight of steel pipe—you can bend any of these shapes accurately and quickly on a Buffalo Bending Roll.



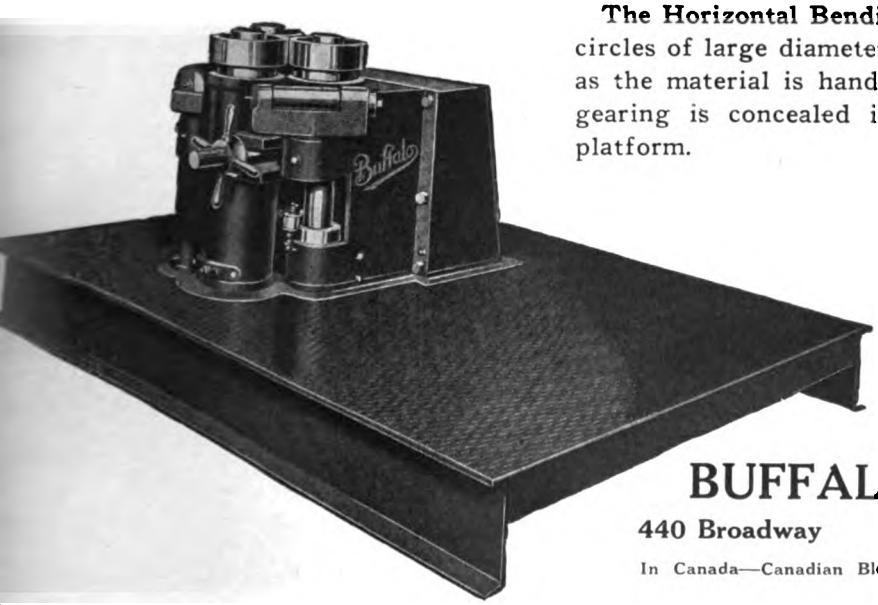
"Buffalo" Vertical Bending Rolls

"Buffalo" Bending Rolls are the modern means of bending arcs and circles of any size. Quicker, cheaper and more accurate. A whole length of stock can be bent into a spiral with one setting of the machine, the spiral then being cut into sections.

Built with pulley or motor drive and with interchangeable rolls for different shapes of stock.

"Buffalo" Horizontal Bending Roll

The Horizontal Bending Roll is recommended where circles of large diameter or heavy stock are to be bent, as the material is handled in a horizontal plane. All gearing is concealed in a pit, underneath the steel platform.



Write for complete information on how a "Buffalo" Bending Roll can cut costs on your bending jobs.

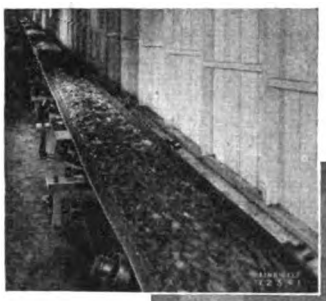
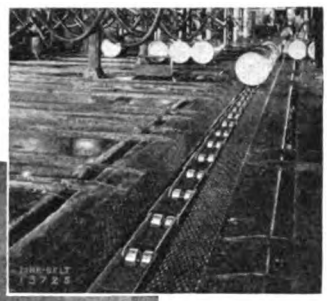
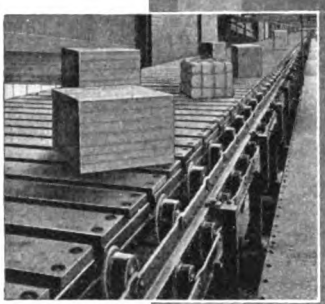
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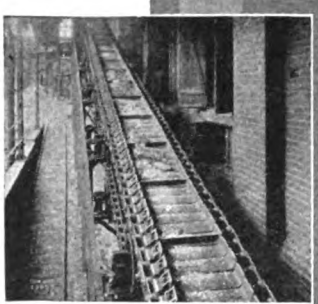
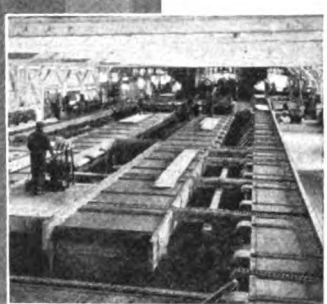
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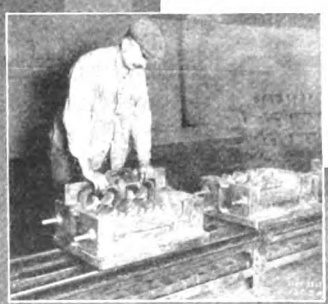
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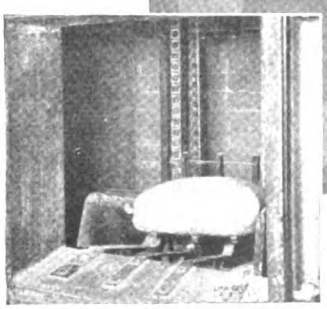
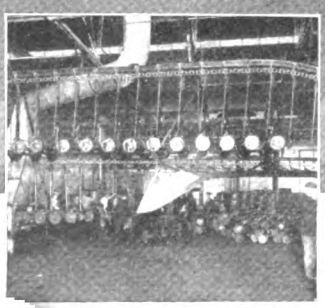
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Handle it with LINK-BELT Conveyor Equipment





CUT production costs and increase output at the same time, with Link-Belt Conveyors.

All kinds of products are being built today on the Link-Belt "progressive assembly conveyor" plan; and where this is not practicable, our time-saving, trouble-saving elevators and conveyors help the workers speed production and reduce "expenses."

No two installations are exactly alike—all are somewhat "different". Let our experienced engineers look over your plant or factory and make suggestions.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery

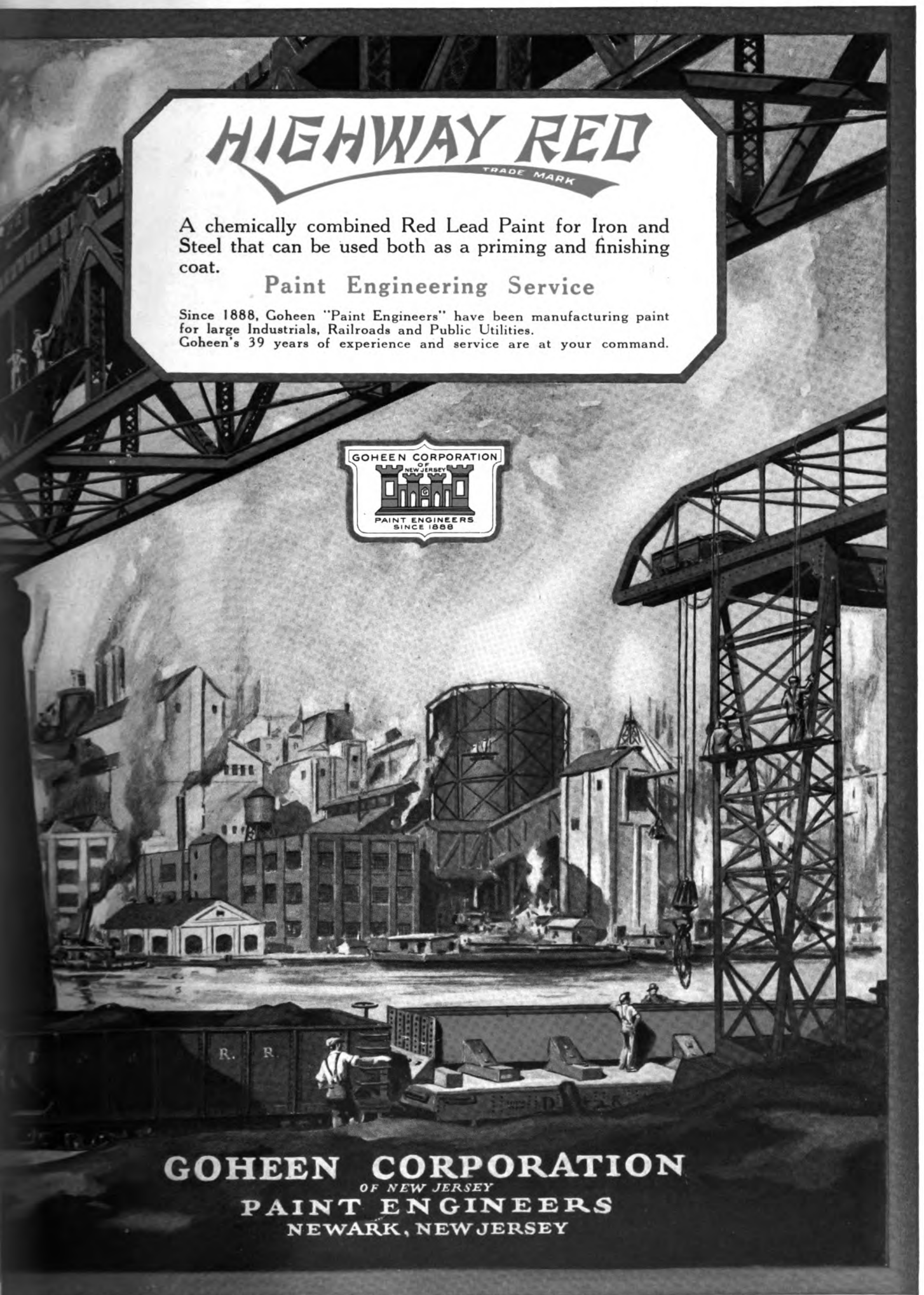
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LINK-BELT
Conveying Machinery

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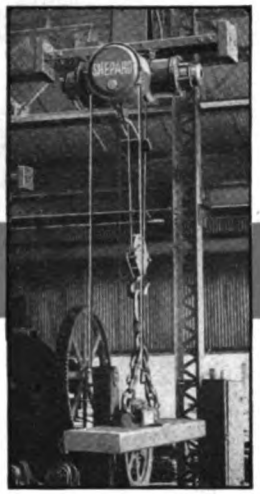
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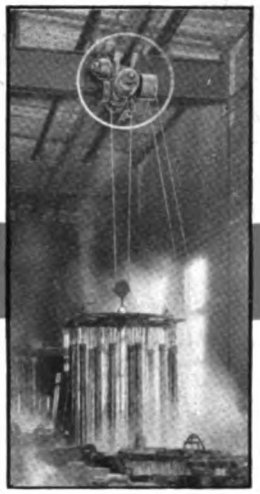
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GILBERT PRINTING COMPANY, INC.
326 W. 39TH ST., NEW YORK

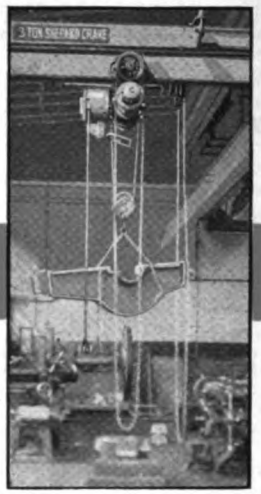
Shepard Form 1-X, Transverse Type Hoist with lug suspension.



Shepard Form 3 Hoist with long winding drum for long lifts.



Shepard Form 1-X Transverse Type Hoist with Geared Trolley for chain racking.



Shepard Form 4, Hook Suspension Hoist hung from jib.



Choose from the most complete line of electric hoists

You can select a hoist precisely suited to the material you handle, and to fit your existing plant conditions.

You may require hoists of slow or fast speed, of long or short lift; machines without trolley for lug or hook suspension, or with plain push type, chain racked or motor driven trolleys; hoists for stationary mounting to operate elevators, derricks, and for opening furnace doors; or hoists to work in close quarters where headroom and clearances are limited—these and many more types and variations are in the Shepard line, the most complete in America.

Each machine is sold on a basis of performance, not of short duration, but for years to come. This trustworthy service is the direct result of Shepard design: a Balanced Drive; straight line unit construction with vital parts completely enclosed and protected from dirt, dust, dampness and atmospheric conditions; thorough automatic oil bath lubrication; motors specially designed for hoist service; and other features that make for safe and foolproof operation.

Shepard represents a known quantity. Time-tested and proved, they are the most widely used electric hoist.

The floor operated hoists illustrated on this page will give you an idea of the extent of the Shepard line, which also includes cage operated hoists of many standard types and electric cranes for various plant requirements.

Shepard engineers are at your service. An informative electric hoist book will be sent on request—you incur no obligation in writing for it.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.

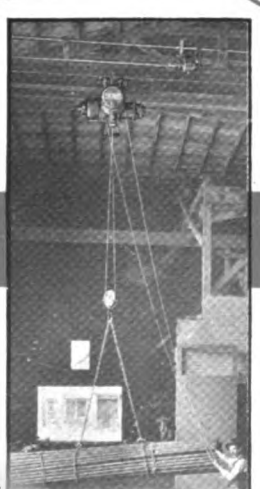
SHEPARD
ELECTRIC CRANES & HOISTS

Largest Manufacturer of Electric Hoists in America

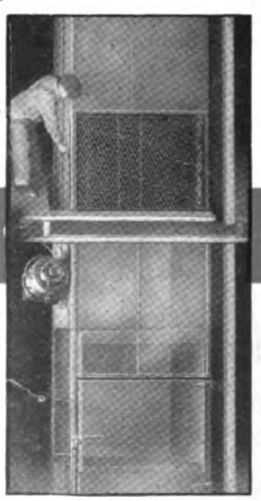
Branch offices are maintained in principal cities



Shepard Form 2 Low Headroom Shown here, Shepard I-Bea



Shepard Form 1 Parallel ype Hoist with plain h trolley.



Shepard Form 8 Hoist for permanent mounting. Shown here, applied to elevator.



Shepard Form 1, Parallel Type Hoist with Motor Driven Trolley. Shown here, mounted on jib crane.

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e 15, 1927

25 Cents

Industry Illustrated

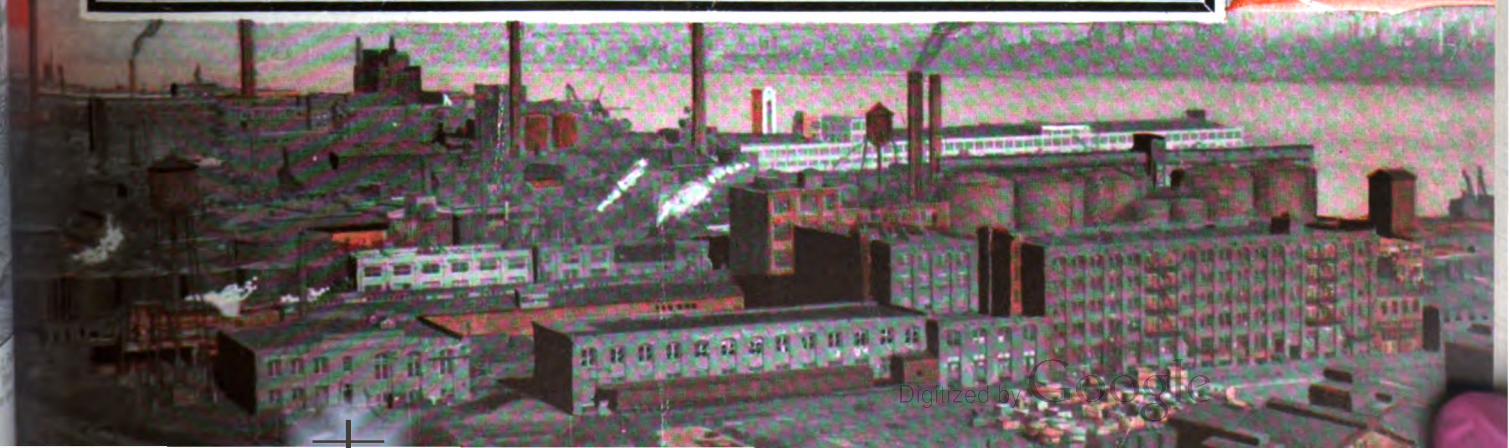
Modern Methods and Equipment for Mill, Shop & Factory

Plant Maintenance

One of the essential requirements for the efficient operation of any industry is that of properly maintaining buildings and other facilities.

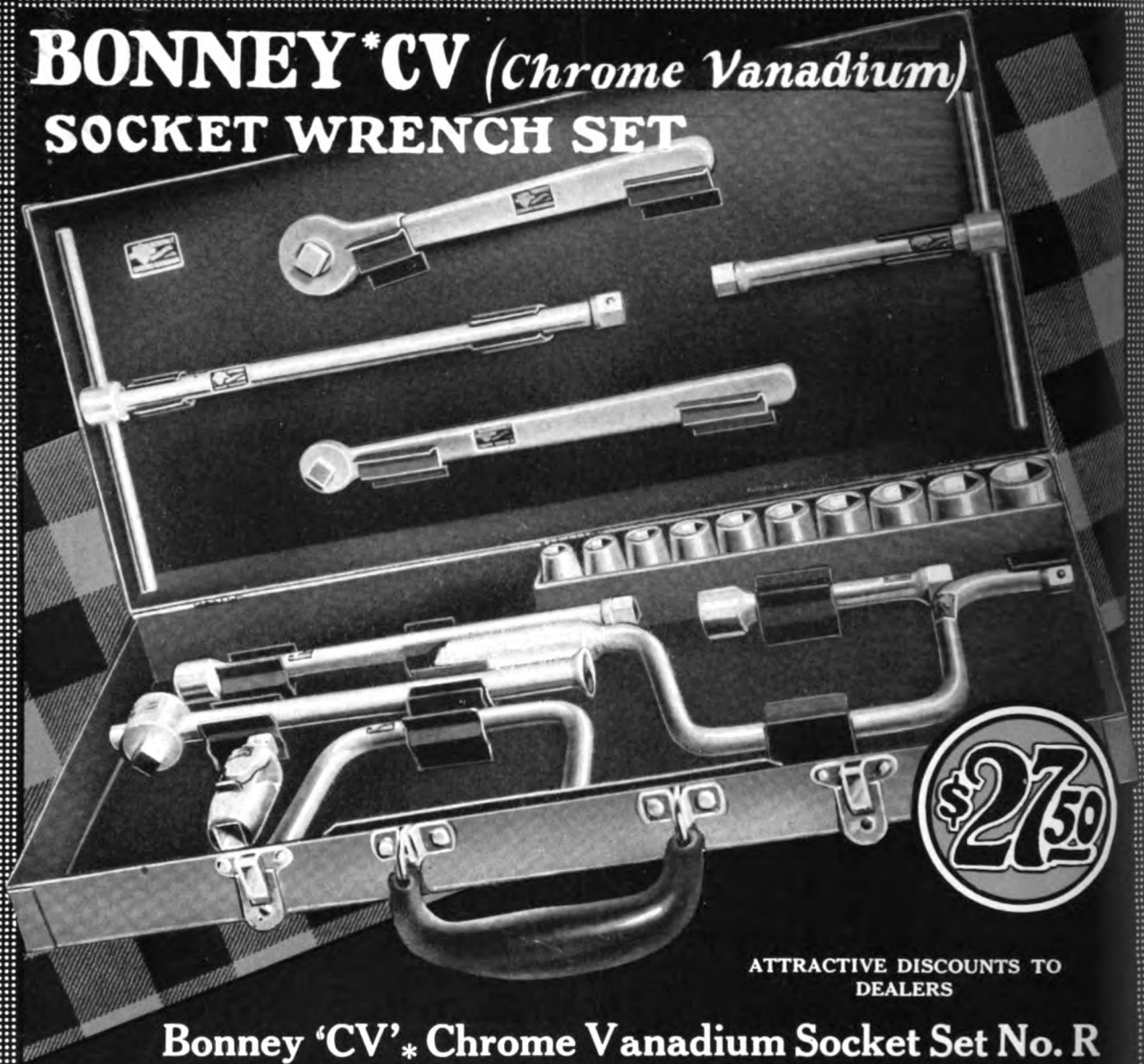
Usually, because of more favorable weather conditions, and in some lines, slack periods, the summer months are best for doing this work.

In mapping out your program for the coming months, give a prominent place to maintenance; planning, in advance, a schedule which will assure that this important work is properly taken care of—for, according to the time worn saying, "A stitch in time saves nine."



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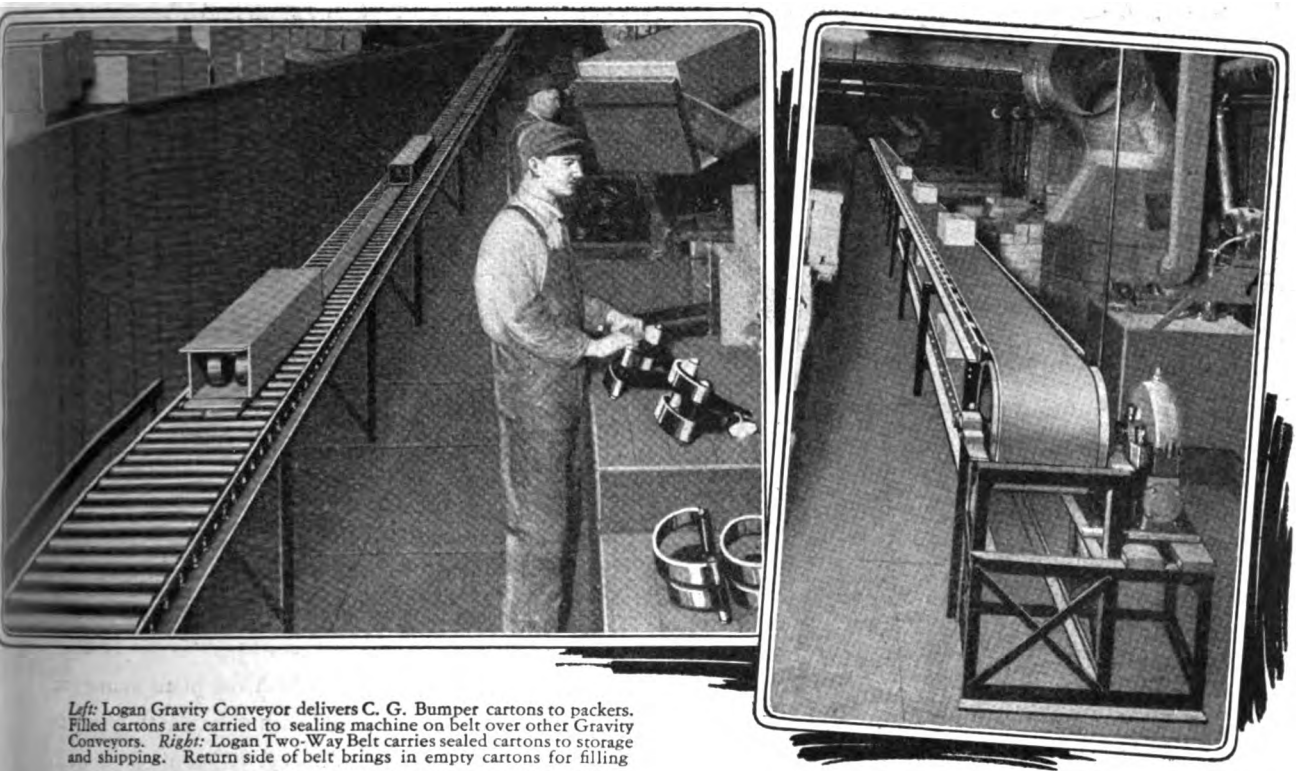
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C Spring Bumpers—another user

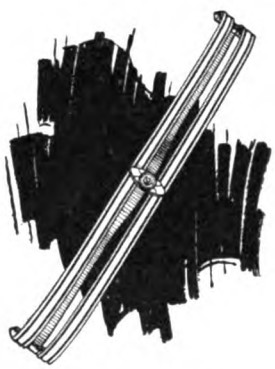


Left: Logan Gravity Conveyor delivers C. G. Bumper cartons to packers. Filled cartons are carried to sealing machine on belt over other Gravity Conveyors. *Right:* Logan Two-Way Belt carries sealed cartons to storage and shipping. Return side of belt brings in empty cartons for filling

GRADUATES *of the University of Hard Knocks—C. G. Bumpers!* Automobile bumpers lead no easy life. Neither do their makers. Competition jumps out from big and little plants everywhere. Realizing the odds, The C. G. Spring & Bumper Company has made good in a big way by consistently applying modern cost-cutting methods to its own particular needs. Here Logan Conveyors are helping to make history in still another industry. Can you afford *not* to investigate the possibilities for similar savings in your own plant? Read "Seven Economies of Logan Conveyors"! A copy gladly on request.

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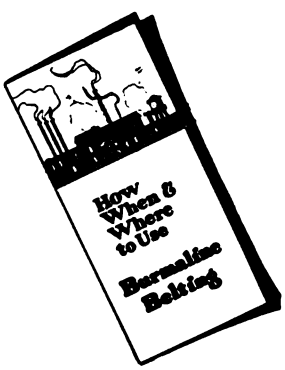
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Harvey Conover Jr.
Business Manager.

Industry Illustrated

Published Monthly by

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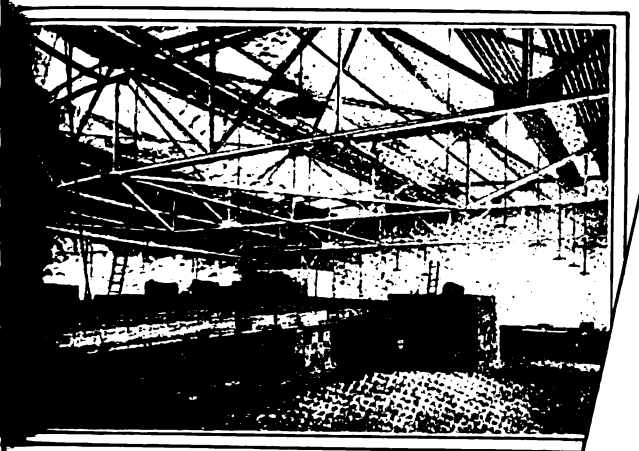
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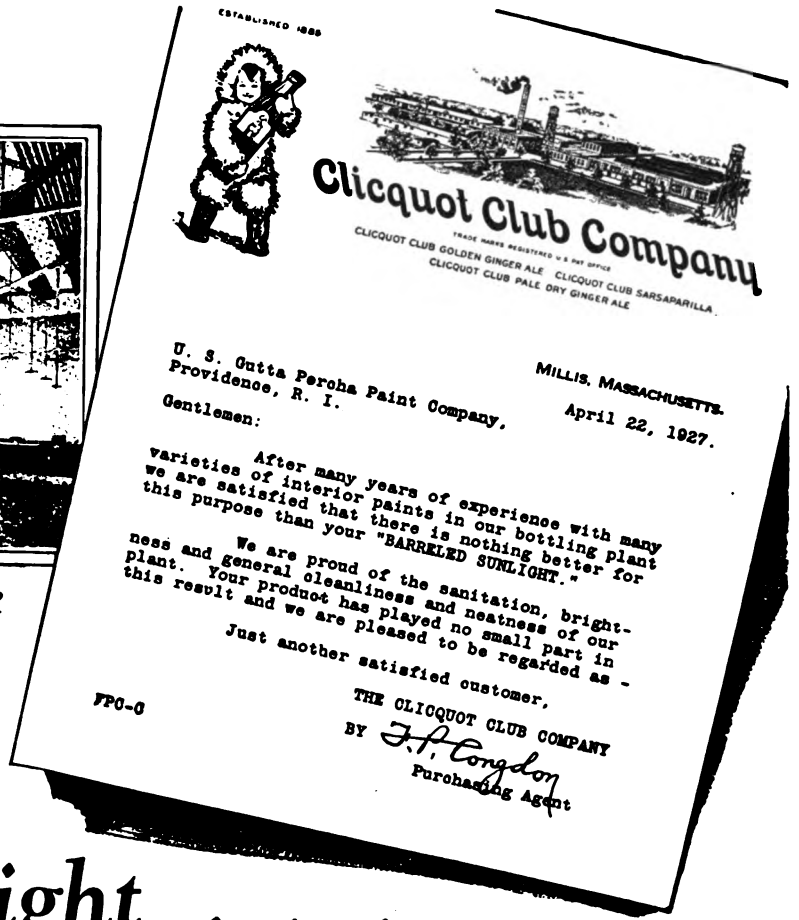
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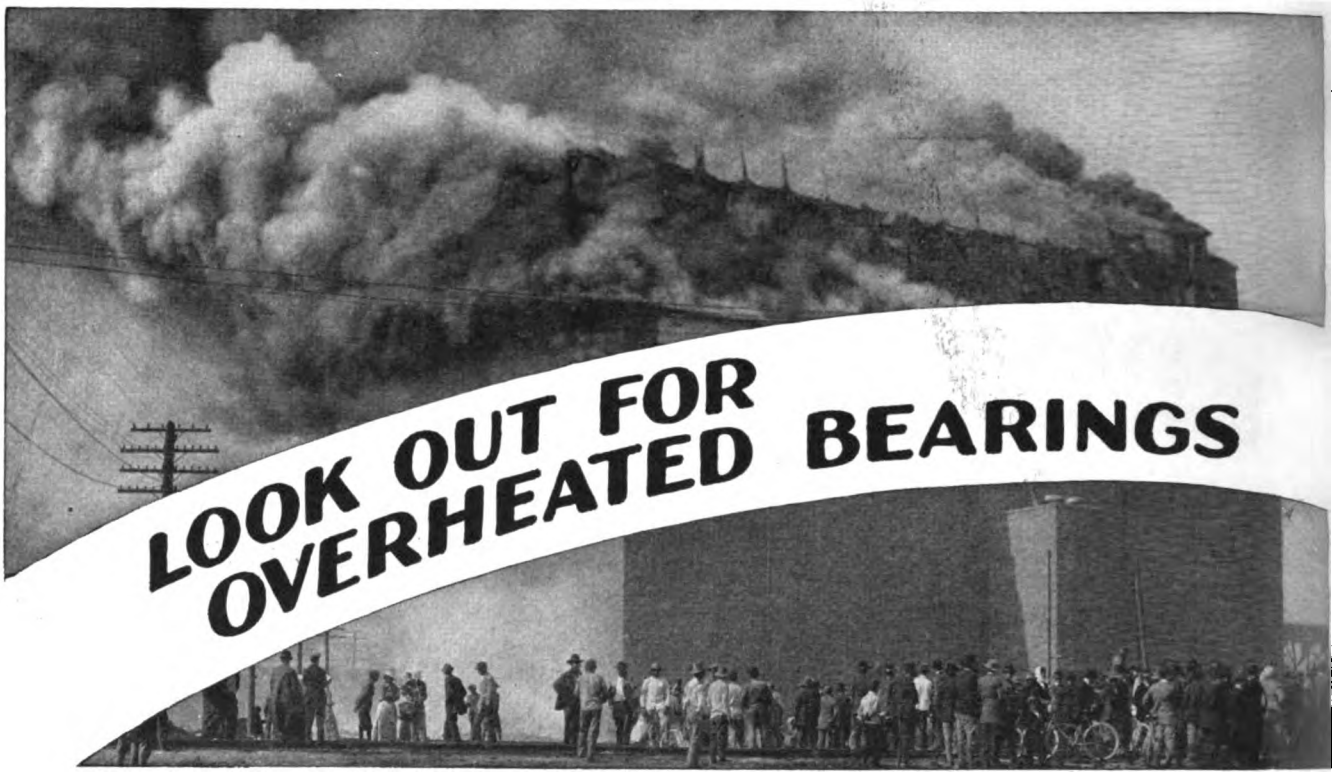
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Chain Wrench to the Pipe:

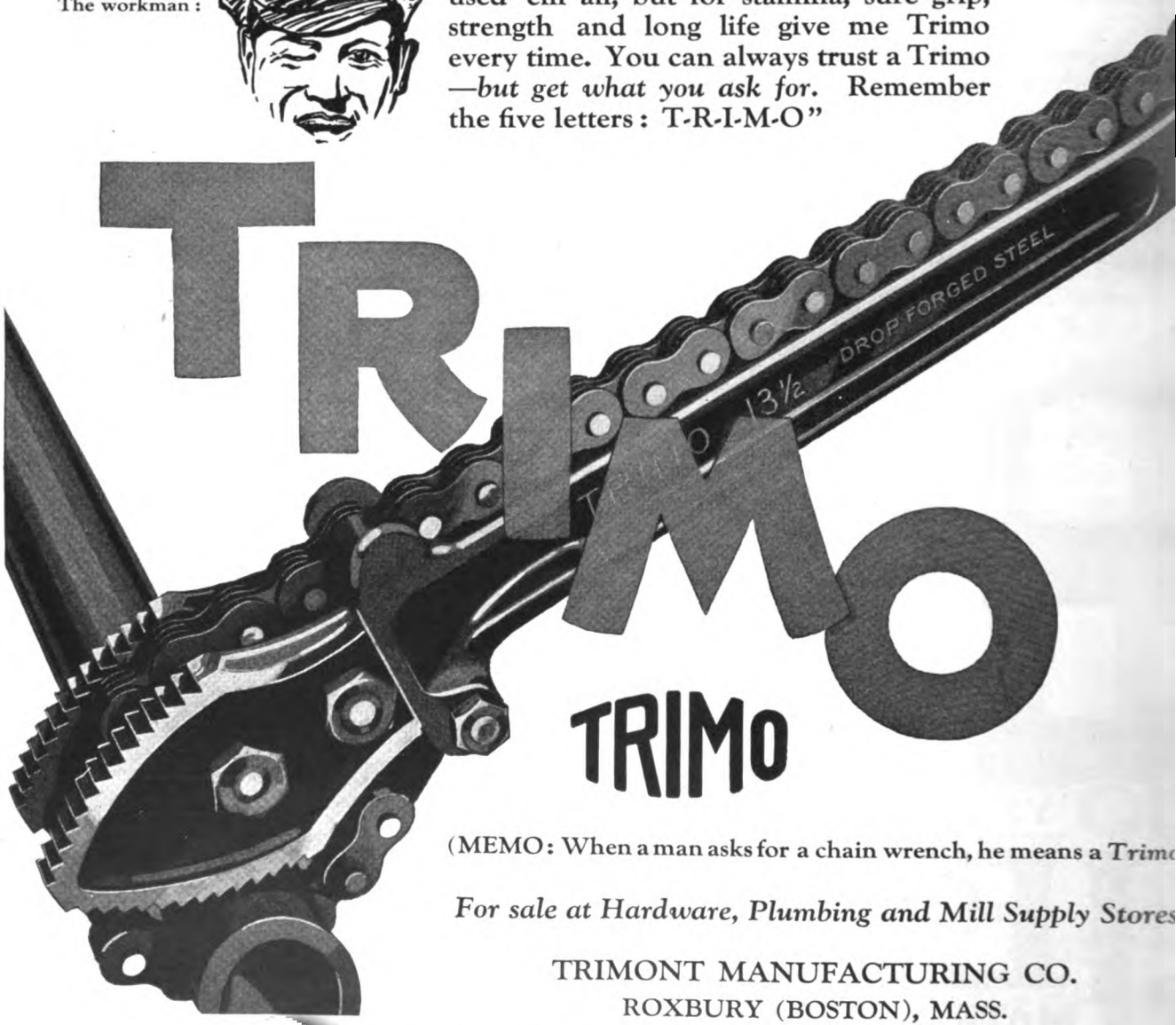


"That's a hot one! all right. The factory didn't put the best selected bar steel, sure grip jaws in my make-up for nothing. Every so often I have to take fresh pipe lines down a peg, so lead me to it. That pipe will know it's up against a *real wrench* when *I* take hold, you bet!"

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In Mills, Shops & Factories

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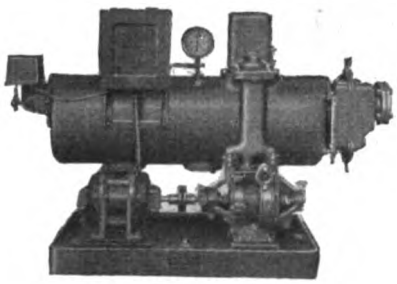
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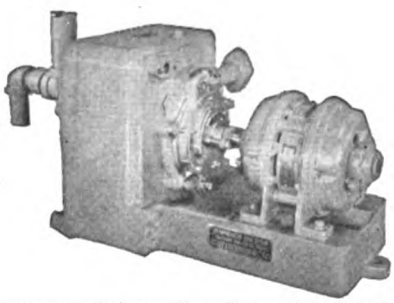
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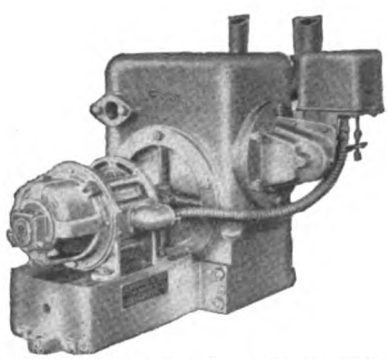
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Eugene G. Grace, President, Bethlehem Steel Corporation © *Bachrach*

Are Steel Prices Going Up or Down?

By George Edwards

PARABLES have been told before this, so here is one for the consideration of our readers who buy bar-stock, shafting, sheets, or shapes. It may seem a bit far-fetched, but it is an eye-opener as to modern ideas of *"invested* capital."

At this critical stage in the state of the steel market, buyers are about in the same position as riders on the street-cars and the subway or elevated trains. Somebody in municipal governmental circles assures said riders (who are also voters) that nothing save a general cataclysm can disturb them in the serene enjoyment of the nickel ride. Changed economic conditions, as higher wages, higher operating costs, longer average hauls, will make no difference according to the political guardians of the public's vested rights.

The traction people say it can't be done for five cents. There is no profit left for the stockholders. They point to the competition by so-called, irresponsible bus-lines, taxicabs and what not, asseverating that these competitors pay nothing, in the way of a fixed investment, except that which includes only the first cost of franchises, rolling stock and garages.

They, on the other hand, have a lot of money tied up in trackage, third-rails and power-plants. They must comply with city ordinances, public service commission rulings and, above all, an inordinate demand for seats by a traveling public, disgruntled with cattle-car treatment during the morning and evening rush periods.

All of which, they state, is not their fault. They could not possibly finance the construction of new lines; they can simply take over and operate those which are constructed by the municipalities. All they can do is to operate them at their fullest capacity. If there is not enough trackage to take care of the traffic, it is certainly up to the civil authorities to build more.

And there is a good deal in this contention.

"But," say the traction people, "we can't make any money, anyway. The five-cent fare dates back to the horse-cars. Since then the trolleys and the electric trains have appeared. Plant investment has grown with huge strides. Everything costs more. A half-mile ride on a horse-drawn vehicle was a long trip. Now people expect to be transported twenty miles or more, for a nickel. How can we do it?"

"Agreed," says that hard-boiled individual, the statistician; "but where the horse-cars hauled 100,000 passengers a year, you transport 5,000,000. Reduce your operating expense to a per capita basis, dear friends, and

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subtract the result from five cents. Do you or do you not make a profit?"

Loud cries of protest: "Certainly not!"

"Well, why not? Your total investment is, say, three cents per passenger carried. You get five. That looks like a gross profit of two cents. Certainly you have enough efficiency engineers on your staff to shave that gross to an interesting net."

"Investment!" cry the companies. "What has investment got to do with it! We pay twice as much, now, as we did when we started in—for coal, generators, cars, copper, rails, not to mention wages. It's not invested capital, it's reproduction cost—less depreciation, of course, we'll grant that—plus present-day expense which should determine the fare. Be reasonable!"

And again, one must admit there is something in that argument. Rails wears out and must be replaced at present day prices, not at those of twenty years ago. Operation and maintenance must be paid for, as of today. Plant deteriorates and new plant costs what it does. Original investment means little or nothing, unless the accountants have regularly posted all legitimate charges to the credit of fixed assets, so that the books reflect all invested funds to date.

Now, the big steel mills claim to be in the same fix. They say that the extraordinary profits they are supposed to be making, exist only in the fevered brains of amateur financiers and their more-or-less gullible clients. Admitting that the original stocks of some of the pioneer companies are bringing in amazing returns on their *original* cost, the steel-makers point out that the sales price of those same stocks has been multiplied out of all proportion to their original cost so that the returns, as of today's value of the shares, do not even represent a moderate interest on the cost of plant replacement.

Hear what Eugene G. Grace, President of the Bethlehem Steel Company, had to say on this subject, in the course of an address before the Cleveland Chamber of Commerce on April 14th, this year:

"Suppose in 1900 a farmer bought 400 acres of Iowa farm land for which he paid $10,000.00; he formed a corporation, transferred the farm to the corporation and issued to himself 100 shares of stock of the par value of $100.00 each, a total par value of $10,000.00. Suppose, further, that the farmer annually cultivated the soil and raised his crops, that he took a portion of his profits each year and with them paid for fencing his farm, constructed farm buildings, acquired adjoining acreage, bought modern machinery, and made other improvements at a total cost of another $20,000.00, and suppose, further, that between 1900 and 1926 the value of farming land in his community increased so that the fair sales value of his farm today with the additional acreage and the improvements in 1926 is $60,000.00. And let us suppose, further, that during this period no change had been made in the [illegible]mer's corporation and that the original 100 s[illegible] outstanding and owned by the farmer. Could any one reasonably say that the farmer should be content with earnings equivalent to say $18 or $20 a share upon his 100 shares of stock when those earnings would be equivalent to only 3 or 3½% upon the present fair value of his investment?"

Bars, rods and light sheets are not sufficiently important, as sources of revenue to the large steel-mills, to keep them going if the demand for billets, structural shapes and rails, falls off. The relative tonnage is too small. Hence the time to buy them is not when the mills are slack but when they are fairly active.

Then he goes on to say:

"Over a long period of time the value of many of the original properties has increased several fold until today the relation of the par value of the stocks of the companies to the actual investment in or the present fair value of their properties is wholly disproportionate."

"Well, what has this to do with the price I pay for steel?" says the reader.

This much, that the remarks quoted led up to the following statement of the actual profits in the steel industry as compared with those of other leading industries of the nation. Again quoting Mr. Grace:

"The figures compiled by the Standard Statistics Company for 1925 show for each of the following industries approximately the following rates of return upon investment:

Industry	*% Earned on Investment, 1925*
Automobile	24.60%
Auto Accessories	19.50%
Food Products	17.00%
Chemicals	14.65%
Building Materials	13.50%
Gold and Silver	12.50%
Tobacco	11.90%
Oil Companies	11.55%
Railroad Equipment	10.60%
Office Equipment	10.20%
Lead, Zinc and Nickel	9.45%
Copper and Brass	4.90%
Shipping and Shipbuilding	4.25%

"The corresponding figures for 1926 have not yet been published, but it is safe to say that in most instances rates of return for 1926 substantially exceed those 1925. Figures bas upon the reports of the largest companies in steel industry, which r resent approximately 8 of the capacity of the dustry, show an aver return on the investm for the year 1925 5.51%."

He then points out t the earnings upon e $100 *actually invested* the steel industry w during the years 19 1925 and 1926, $4 $5.51 and $6.64 respectively. The total investm through the sale of securities or the re-investment earnings in plant, was $4,750,000,000. In terms of market value, this sum would reach the round figure $6,000,000,000 as of this year. Upon that basis earnings would be $3.80, $4.37 and $5.33 for the th years named. The average for the three years, ba on invested capital, would be $5.70 and upon reproc tion cost less depreciation, $4.73.

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To further illustrate his point that steel earnings do not compare with those of another great national industry, he cites these figures:

"The full significance of these figures will perhaps be better realized from a comparison of the results of the outstanding company in our steel industry with those of the outstanding company in the motor industry. In 1926 the United States Steel Corporation, with a capitalization (including surplus) at the end of the year of about $2,185,000,000, earned $143,000,000. On the other hand, the General Motors Corporation, on a capitalization of $37,000,000, earned $186,000,000. The net return of the Steel Corporation was $6.54 for each $100.00 of capitalization, while that of the General Motors Corporation was approximately $29.20 for each $100.00 of capitalization."

Of course, these are over-all figures. It is quite within reason that the profits on bar-stock, shafting, plates, and tool-steel, in which our readers are primarily interested, may be high while those on structural shapes, rails and billets may be low. But the fact remains that the steel companies depend upon their gross sales of *gross* output to show dividends. So that, if the industry, as a whole, is not profiting, as compared with other national activities, the price of all steel commodities manufactured, cannot be expected to soften.

As a matter of plain common sense, the greater the total tonnage output of all forms of steel, the less will be the price of each classification. A popular misconception is expressed about like this: "There is so much more money in I-beams, when the building business is good and in T-rails, when the railroads are going strong, that the mills would naturally charge more for bars and special alloys to keep us out of the market."

There may be a certain amount of truth in that; but, on the other hand, it would hardly pay to run a battery of blast-furnaces, converters and rolling mills, just to supply the moderate demand for those particular commodities—without a heavy increase in price.

In other words, the most favorable buying market for manufacturers who purchase bars, tool-steel, sheets, angles and other light steel products is that which obtains when the mills are busy on heavy production orders. When the building industry is good or when the railroads or ship-yards (God save the mark!) are placing orders for cars, plates, and shapes.

Now, the production of big buildings is sloughing off. In the next two or three years, there will be a considerable decline in this market for shapes. There is nothing in the way of big demand to take its place. Foreign shipments from the mills will probably remain about as at present. As it is, most of the mills are running at some 75 per cent. capacity.

Therefore the manufacturer who is buying steel on the "hand-to-mouth" plan, in the expectation that a slackening demand for other steel products will tend toward a reduction of price of those in which he is interested, may find himself sadly disappointed.

There is another side of the steel market which is not so thoroughly understood by the manufacturer-purchaser of steel. It is the steel-jobber industry. More than once, in a long experience in industrial engineering, the present writer has heard this opinion expressed by consumers of steel in the shapes under discussion:

"Why should I worry if the mills shut down? I can always buy from the jobber. I have him under contract, anyway, for warehouse delivery. I simply switch from mill delivery to him."

Which would be a first-class argument but for the fact that the jobber, versed in the fluctuations of his business, has already protected himself against such contingency in the wording of his contract.

His profit is none too secure in the best of times. Mills sometimes have a bad habit of trying to carry water on both shoulders. They sell to the jobber at a price and then—sometimes—sell to the consumer at the same price.

Besides the jobber is far from being as good a risk as the mill. The steel mill can afford to shut down completely for six months or a year. Meanwhile the customers can go hang. "Sorry; the mill is shut down. When we start production again next year, we will give your order priority." What appeal is there from that. The jobber is occasionally the victim of the same line of argument. He knows he may be, so he does not commit himself to any contract for delivery he is not sure of being able to carry out.

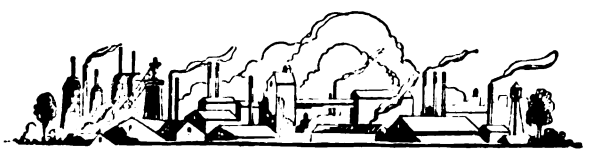
On the whole the forward-looking consumer of steel stock, other than fabricated members will do well to buy cautiously but with due regard to the improbability of a future price reduction, which might leave him with a high-priced inventory on his hands. The opposed probability, that curtailment of large orders might cause the mills to shut down altogether is remote, but not beyond possibility of realization.

Therefore, it would seem that the same policy which governs the purchasing activities of the cotton mills, might well be applied to those of plants whose raw material is largely steel. The buyer in a cotton mill is a ticker-tape watcher. When he sees a decline of a few points he loads up with stock, either for spot or future delivery, as his judgment and experience dictate.

He takes a chance but not a very long one, in normal times.

The manufacturer of products in which steel is used is not so accustomed to that form of buying. As a rule, he is only concerned with having a sufficient stock on hand to meet his production requirements. When his inventory card shows a minimum on hand, he buys more. If the market is high he buys in small quantities, otherwise in larger amount.

But, with the steel situation, about as outlined above, it will pay to watch the market more closely and continuously. When it is particularly favorable, it may be well to buy for future rather than immediate needs. For the indications are that no important break in steel prices may be expected. And this is especially true because the steel industry is strongly organized, behind a high tariff wall, and the producers are determined to maintain the present scale of prices.



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The Lift Truck as a Factor in Reducing Materials Handling Costs

By Frank L. Eidmann

Associate Professor of Machine Design
School of Engineering, Princeton University



Fig. 1. A view of the assembly floor at the Cincinnati Milling Machine Company, showing the assembly of machines on skids.

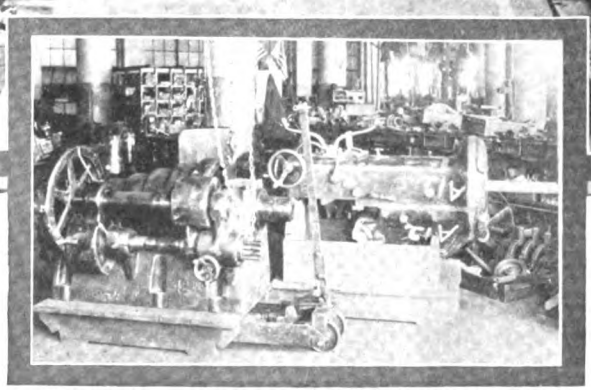


Fig. 2. Heavy units for engine lathes are assembled on lift truck skids.

IT has been estimated that in the average large plant which manufactures diversified products involving a variety of materials and operations, the material is in actual process for only 10 to 20 per cent. of the entire time it is in the plant. During the remaining 80 to 90 per cent. of the time the material is either in storage or is being handled to or from the processing operations.

Much attention has been given to improvement of the manufacturing processes, manufacturing equipment and the point [illegible] where it is no longer so simple to [illegible] spectacular savings in directions. Until comparatively recently, however, has not been generally appreciated that materials han and storage play a major role in the cost of produc If profits are to be increased, the ratio of the han and storage time to the actual processing time mu reduced to a minimum.

The lift truck is proving itself an important fact

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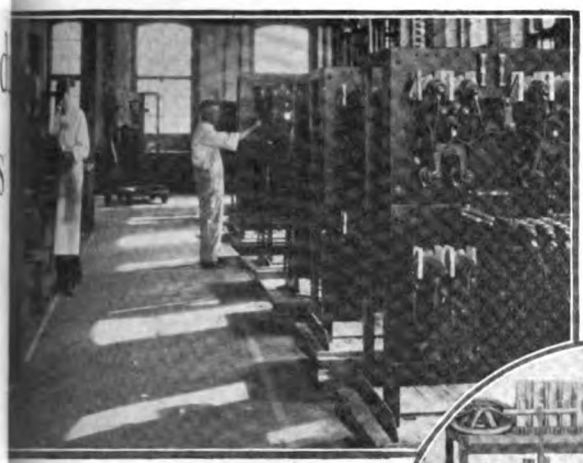


Fig. 3. Control boards are assembled on skids.

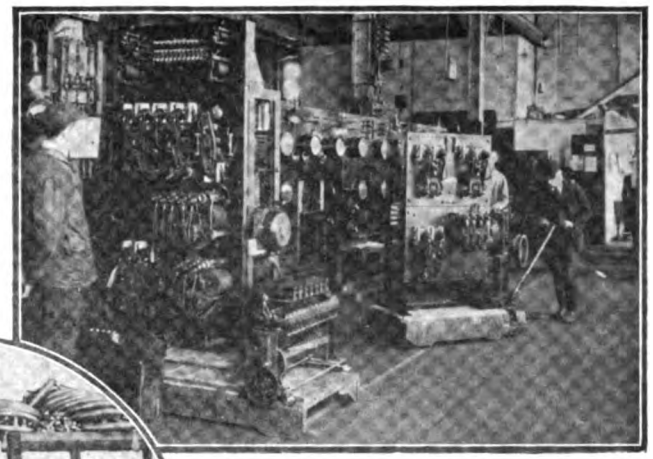


Fig. 4. After assembly the control boards are taken to the test room on lift trucks, remaining on skids during the test.

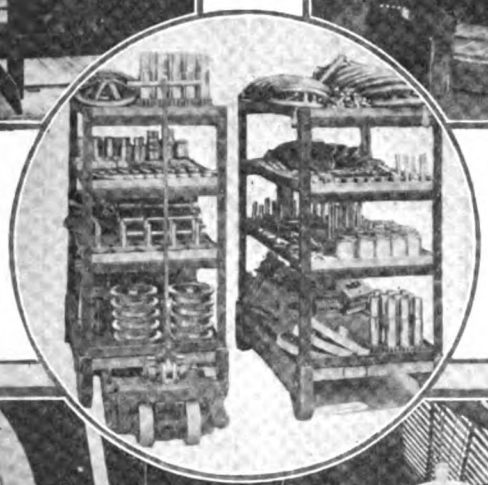


Fig. 5. Each skid rack contains the small parts for ten machines.

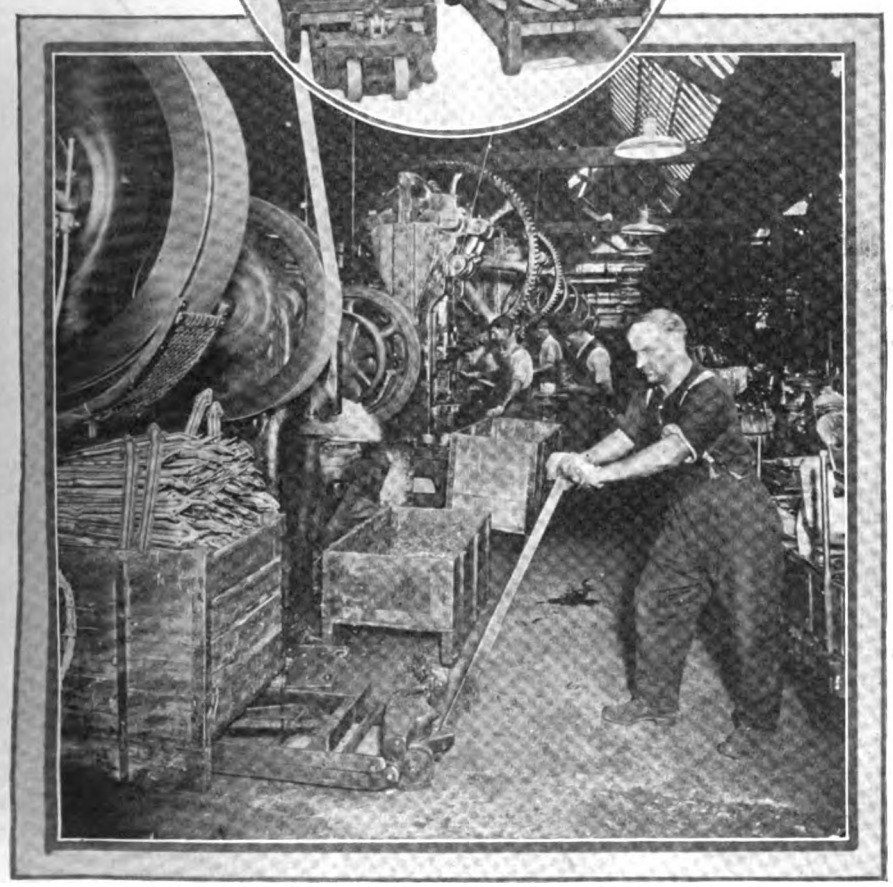


Fig. 6. Handling heavy loads in places which would be difficult to serve with other forms of handling equipment.

reducing this ratio, and there are now very few plants where the lift truck and skid system is not employed to some extent. There is hardly an industry where the lift truck cannot be applied to great advantage.

In some plants practically all of the material handling is done on lift truck skids. For instance, in many plants the material remains on skids from the time it enters the receiving room until it leaves the factory in the form of finished product. Many machine tool manufacturers follow this practice. The castings are placed on lift truck skids in the receiving room and they are taken from operation to operation on these skids. Fig. 2 illustrates the sub-assembly department in a plant which builds heavy-duty machine lathes. Here the various units of the lathes are assembled on skids and are then transported to the final assembly department, where the sub-assembled units are brought together for assembly of the complete machine. A general view of the assembly floor of the Cincinnati Milling Company is shown in Fig. 1. The complete machine is assembled on skids and it will be observed that many sub-assembled units and heavy finished castings are temporarily stored on skids in the left background. After the machine is completely assembled it is "run in" (usually by being belt driven from a portable motor) and is then tested, while still on the skid. Next it is taken to the paint department, where it is painted, and finally it is transported to the shipping department, where it is crated for shipment—not having been removed from the skid.

Another application of the lift truck system to the assembly department of a machine tool plant is shown in Fig. 5. In this particular installation the machines are assembled in groups of ten. The smaller parts are placed in skid racks in the storeroom and may be conveniently taken to the assembly department on a lift truck.

The practice of assembling machines and equipment on skids is now finding application to many lines of machinery. Fig. 3 illustrates the assembly of controller panels at the Otis Elevator Company, and in Fig. 4 the

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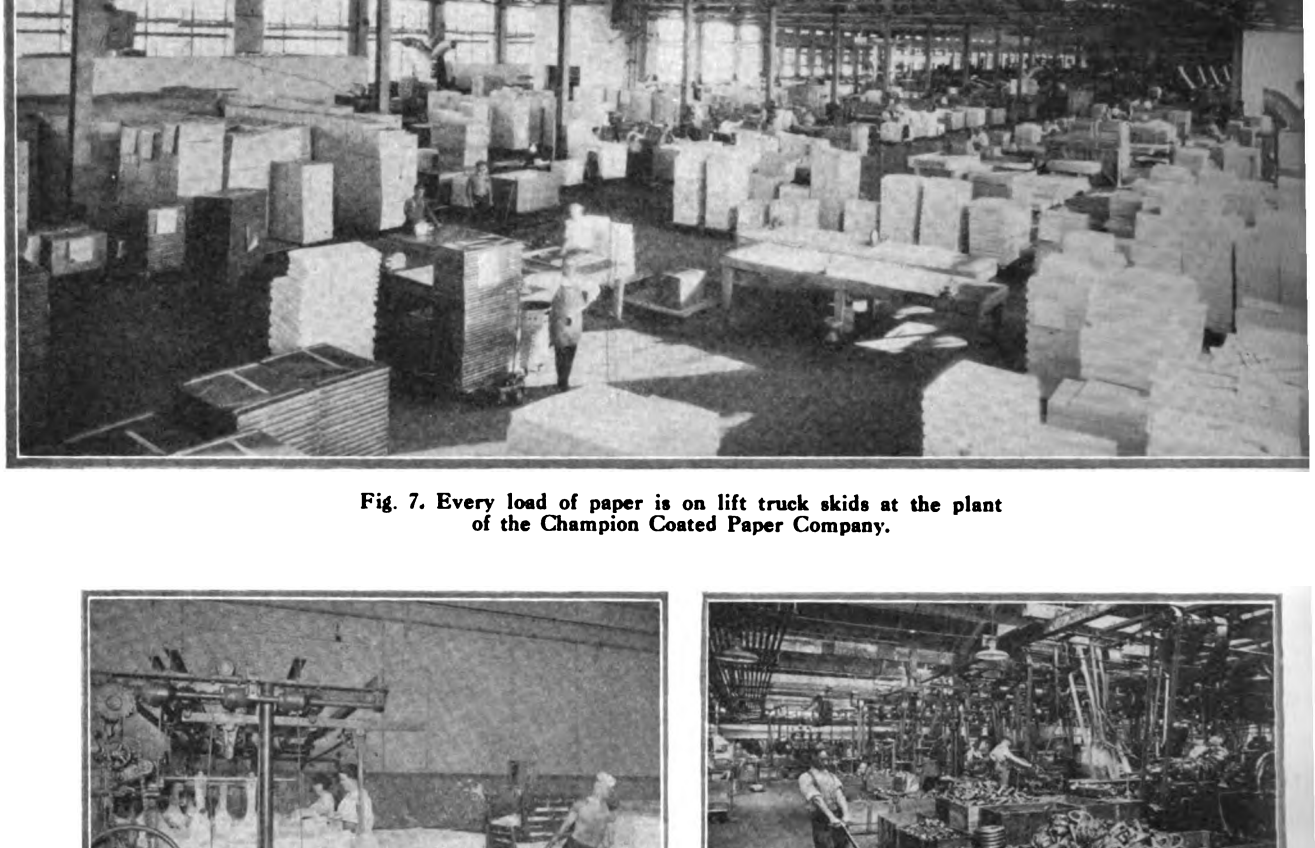


Fig. 7. Every load of paper is on lift truck skids at the plant of the Champion Coated Paper Company.

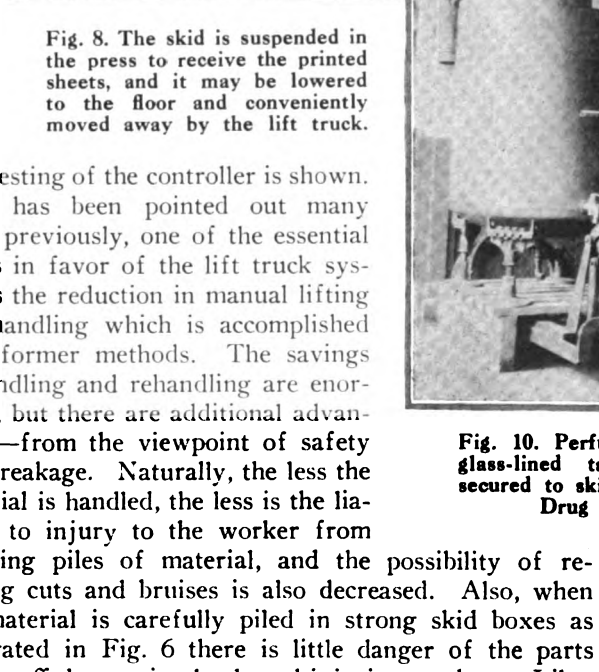


Fig. 8. The skid is suspended in the press to receive the printed sheets, and it may be lowered to the floor and conveniently moved away by the lift truck.

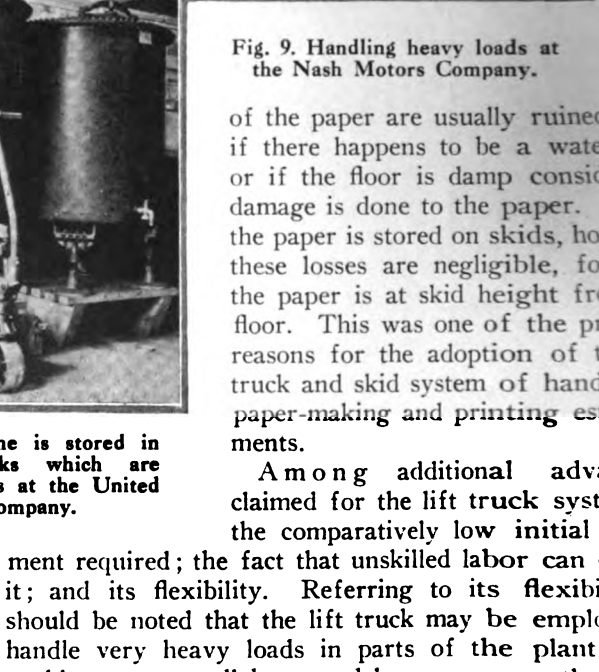


Fig. 9. Handling heavy loads at the Nash Motors Company.

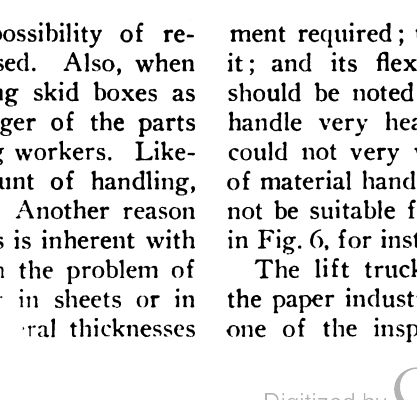


Fig. 10. Perfume is stored in glass-lined tanks which are secured to skids at the United Drug Company.

final testing of the controller is shown.

As has been pointed out many times previously, one of the essential points in favor of the lift truck system is the reduction in manual lifting and handling which is accomplished over former methods. The savings in handling and rehandling are enormous, but there are additional advantages—from the viewpoint of safety and breakage. Naturally, the less the material is handled, the less is the liability to injury to the worker from tumbling piles of material, and the possibility of receiving cuts and bruises is also decreased. Also, when the material is carefully piled in strong skid boxes as illustrated in Fig. 6 there is little danger of the parts falling off the moving loads and injuring workers. Likewise, on account of the reduced amount of handling, there is a great reduction in breakage. Another reason for reduction in destruction to the goods is inherent with the skid itself and is well [illegible] in the problem of storage of paper. Whe[illegible] in sheets or in rolls—is stored directl[illegible]ral thicknesses of the paper are usually ruined; if there happens to be a water or if the floor is damp conside damage is done to the paper. W the paper is stored on skids, how these losses are negligible, for the paper is at skid height fro floor. This was one of the pri reasons for the adoption of th truck and skid system of handli paper-making and printing esta ments.

Among additional advan claimed for the lift truck syste the comparatively low initial i ment required; the fact that unskilled labor can op it; and its flexibility. Referring to its flexibili should be noted that the lift truck may be employ handle very heavy loads in parts of the plant could not very well be served by cranes or other of material handling equipment. Overhead cranes not be suitable for use in the portion of the shop s in Fig. 6, for instance.

The lift truck and skid system is in general u the paper industry and in printing plants. Fig. 7 s one of the inspection rooms of the Champion C

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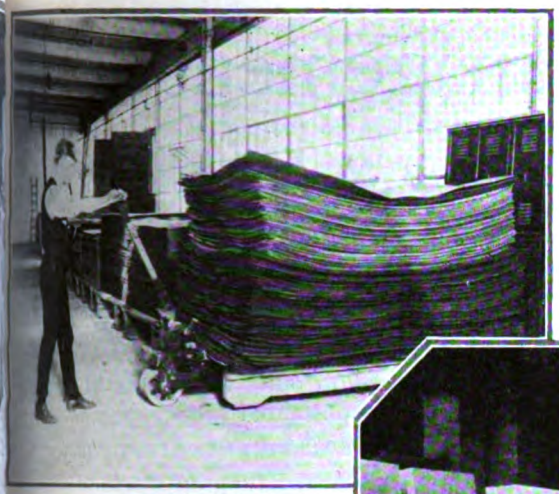


Fig. 11. Awkward loads are handled with ease by one man at the Diamond State Fibre Company.

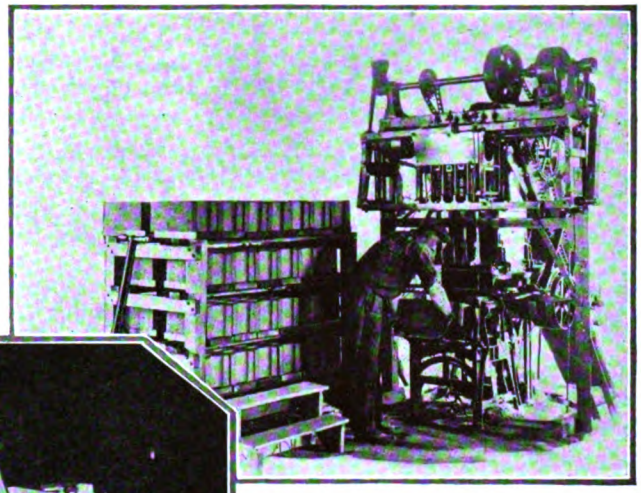


Fig. 12. The lift truck serves the concrete-block-making machine.

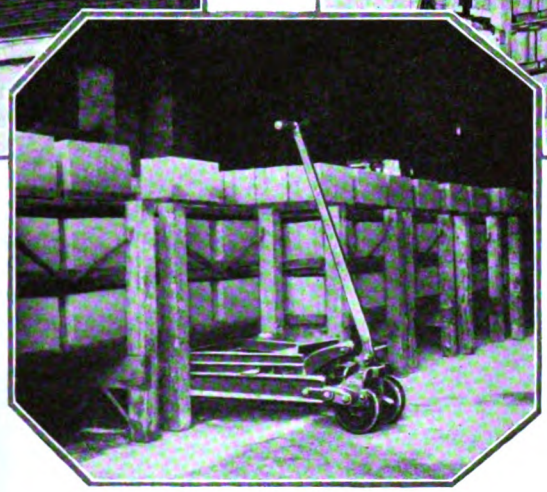


Fig. 13. The loaded skid racks are transported to the drying rooms on lift trucks.

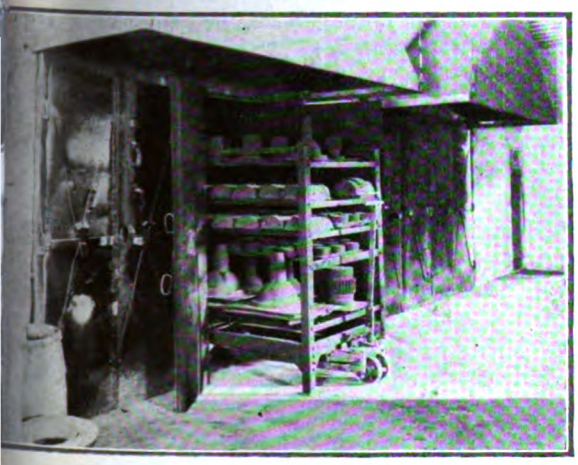


Fig. 14. Handling sand cores to the drying ovens on skid racks which are provided with adjustable shelves.

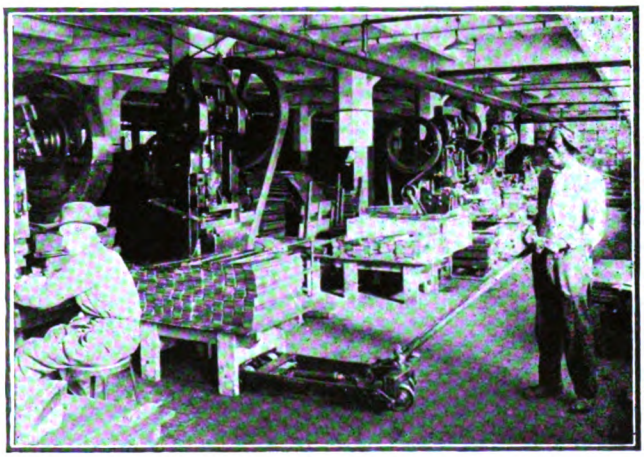


Fig. 15. Skids which are built to the worker's waist height save back strain.

aper Company and it will be observed that every load paper is on skids. Fig. 8 shows how the printed eets coming from a large printing press are deposited a skid, which is supported in a sling in the press d which is automatically lowered as it is loaded. It a simple matter for the operator to deposit the loaded d on the floor and to transport it, with the lift truck, other parts of the plant without touching the paper.

Fig. 9 shows the use of the lift truck in the plant of Nash Motors Company. Many thousands of lift cks are employed in the automotive industry where loads are unusually heavy and the service severe. In automobile plant I was informed that there were re than 15,000 skid boxes in service.

The United Drug Company has an interesting apcation of the lift truck in the perfume department. e perfume is stored in large air-tight glass-lined vats, ch one of which is secured to a lift truck skid as shown in Fig. 10. This arrangement facilitates taking the vat to the mixing room and also to the scales for weighing.

Fig. 11 illustrates the handling of heavy, bulky loads without difficulty. These awkward loads of fibre sheets are easily handled by one man with a lift truck at the plant of the Diamond State Fibre Company. With the powerful leverage that is provided, one man can lift more than 10,000 pounds.

As is apparent, the skids of the various types are comparatively inexpensive, and one lift truck may serve a large number of skids. Thus the first cost of the lift truck system is low. It is a simple matter to install this method of handling inasmuch as skids and additional lift trucks may be provided as they are needed. I have seen small factories start out with a single lift truck and a few skids, and as the business grew the materials handling system naturally grew correspondingly.

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Time Study—A Management Tool

A Discussion of Its Application to Industry

By L. A. Sylvester

WHEN one speaks of time study it is usually connected in the average person's mind with the subject of piece rates. As a matter of fact, this connection is more casual than fundamental. Piece rates have existed through the ages. There is a definite record in the laws of Hammurabi, who reigned over Babylon from the year 2285 B. C. to 2231 B. C., that they were a common practice in those days. The laws of King Hammurabi were written over 4,000 years ago, even before the laws of Moses, and in those laws are contained a regulation fixing the price for building houses at a definite piecework rate.

It was not until near the close of the nineteenth century that the method of determining piece rates by time study was first applied by F. W. Taylor. Even in the modern use of time study its connection with the piece rate is rather incidental, its fundamental purpose being to establish improved methods and conditions, and the purpose of a piece rate or other wage incentive plan is to act like a pawl on a ratchet and assure the maintenance of the improved methods and conditions. It is obvious that when a worker is paid an incentive predicated upon the use of certain tools or upon performing the work in a prescribed manner, he becomes financially interested in performing the work in such a manner that he will make the additional money offered.

Management has three very fundamental tools which deal with the three chief factors of industrial work. These three factors are:

1. Time
2. Energy
3. Environs

The three corresponding management tools are:

1. Time Study
2. Fatigue Study
3. Condition Study

At the present time we will deal exclusively with the subject of time.

When each one of us is born, we are endowed with a supply of time and when we are bankrupt in respect to time we are dead. The success or failure of everyone largely depends on their care in utilizing this important element. Failure is almost always due to the misuse and wasting of time. In its very essence time is therefore of great importance to every one of us, particularly in regard to production problems. We are confronted not only with making products with economy from the standpoint of time but we are also interested in making delivery of these products within specified times.

Time study is a most direct means of making substantial improvements and savings. There is hardly any line of industry which is not susceptible to the application of time study and it is rare indeed to find a production operation where economy cannot be effected by this means.

Time study should be regarded as an industrial management tool not only in every factory but in every office. There has been sufficient accomplishments in the application of the method to office operations to have definitely determined its substantial value.

Requisites of a Sound Time Study Policy

Any executive in contemplating an actual or proposed use of time study in his organization should face very squarely the problem of placing his policy upon a sound foundation. There are a certain number of requisites which are absolutely fundamental in this connection and each one should be carefully considered.

1. The technique used must be such that it will enable the organization to establish standards which can withstand the test of time and obviate any necessity for temporary rates or adjustments. There is no clear demarcation of the use of temporary rates and rate cutting. The ill feeling caused among the workers due to the obvious injustice of rate cutting is such that it will sooner or later undermine the entire structure of standardized operation, and wreck the time study department.

2. Improvements made by operators should not be followed by a rate reduction. When this is made a part of the time study policy, management gets the benefit of the increased production, and furthermore by perpetuating the old standard and permitting the worker to receive the benefit they encourage further suggestions. The creative genius lying dormant in a group of workers is considerable and by proper handling of improvements may by the workers a source of real saving and a very substantial asset can be capitalized.

3. The time study technique should operate to secure increased production through improved conditions and the developing of skill. There are many examples where time study has been used merely to drive workers longer and more strenuously. This is indefensible and it should be the aim of any manager to secure his increase in production not at the expense of his workers but through a change of conditions, the improvement of the worker's skill and ability. It is not infrequent for work to actually be made easier even though the production is substantially increased.

4. The worker must be safeguarded for accident and fatigue. When operations have been standardized and the labor force reduced, the per capita worth of each individual worker is greatly enhanced and even with regard to humanitarian reasons pure business sense dictates that every precaution should be observed to prevent injury or depletion of vital reserves. No improvement, regardless of how productive it may be, should be installed until the safety of the worker is assured. I believe that it is a common experience of industrial engineers to find that a standardized operation invariably results in a reduction of hazards.

5. All speculative risks caused by conditions which the time study engineer has been unable to standardize

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and which are beyond the workers' control should be assumed by the management by guaranteeing a base wage comparable to the market rate. The unfairness of making earnings fluctuate up and down sharply due to chance conditions can very largely be eliminated by a proper choice of wage incentive plan.

6. No time study policy is complete unless it is contributing to the development of the science of work. This idea is very important and due emphasis should be given to the fact that work is governed by definite laws which are determinable and the study of which are wholly profitable. The fundamental factors in any given operation can very frequently be placed in the term of an algebraic formula or in chart form. The use of time study in industrial plants is making rapid strides. It is becoming more and more as necessary a part of a works manager's equipment as a foot-rule in a carpenter's kit. While there is no doubt that carpenters can frame and build a house without the use of a foot-rule, each one of us would prefer to live in a house where a foot-rule had been used. Any plant which has not made use of an up-to-date time study technique will undoubtedly find it highly profitable and interesting to undertake, especially in view of the results.

Determining Why Gases Explode

By M. E. Clements

SAMPLES of dangerous gases, collected from all parts of the United States, are being tested by chemists of the federal Bureau of Mines in elaborate apparatus designed for the express purpose of finding out just what degree of heat or proximity to flame is required to cause the gases to explode. These gases are gathered from mines, blast furnaces, factories, city sewers, city gas mains, and all sorts of queer places. They represent a great variety of industrial gases that are likely to be encountered by workers in the mines, mills and factories of the nation, as well as many types of gases which are constantly taking a toll of life in the homes of this country. Methane, acetylene, sewer gases, gasoline vapors, natural gas, common city gas, and some anesthetic gases are examples. It is the ignition of gases of these types that is often responsible for mysterious explosions that occur in sewers, mines, chemical plants, hospitals, and even in private homes.

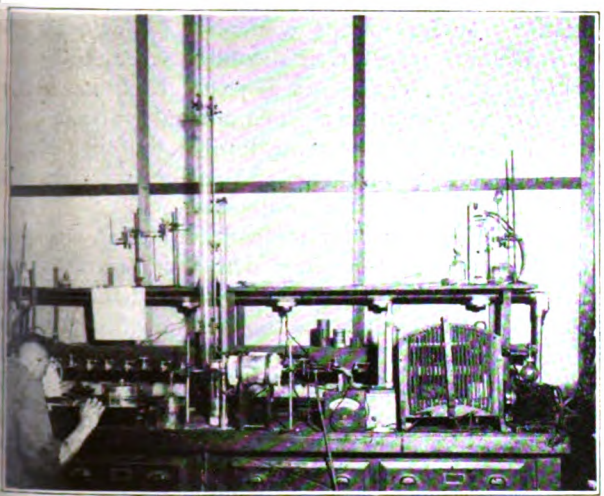


Fig. 1. Apparatus Used by United States Bureau of Mines for Testing the Explosive Qualities of Gases.

The safety of millions of people depends upon the obtaining of exact knowledge as to the degree of explosibility of different concentrations of these industrial gases. With this in mind, the Bureau of Mines chemists have specially devised apparatus in which samples of a great variety of gases, mixed with varying proportions of air, are tested to determine their inflammable limits and the temperatures at which they will ignite.

The inflammable limits of gases are determined in the long vertical tube shown at the left of the illustration. The tube is entirely emptied of air and the gas-and-air mixture is then forced within. The bottom of the tube is closed by ground glass plate. To test the likelihood of the gas to ignite, the plate is slid from the end of the tube, and a flame is drawn across the open end. Inflammability occurs when the flame enters the bottom of the tube and travels entirely to the top.

The large upright pipe shown in the other illustration is used for the purpose of checking the determinations of inflammable limits of gases, as made in the smaller apparatus. The distance to which the flame extends is shown by the glass window along one side. In the top is a paper head to release the pressure when the exploding mixtures are more violent.

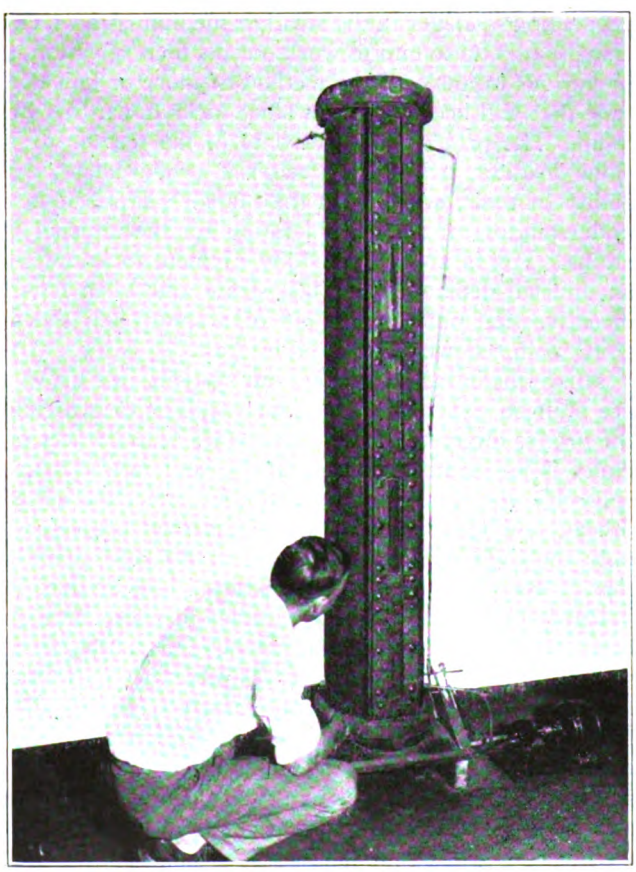


Fig. 2. A Device for Determining the Inflammable Limits of Gases as Used by the United States Bureau of Mines.

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Shipping as Scheduled Is a Production Problem

Shop Scheduling and Planning Important Factors in Prompt Deliveries

By F. B. Avery

THERE are of course many methods of insuring delivery of orders on schedule, most of which are no doubt justified by the individual conditions. The determination of the method to use is oftentimes based on expediency but sometimes on the cost.

Delivery is of paramount importance in most lines. A reputation for shipments a few days shorter than competition is oftentimes of great value in securing business. Of even greater value is the reputation of shipping as promised.

Speedy shipments mean a well-organized shop personnel of more than usual coöperative nature. A prerequisite is confidence of the organization in the ability of the man who schedules to estimate what is possible—confidence in his sense of fairness—that he does not demand unusually difficult tasks unnecessarily—confidence that the date promised on an order means what it says and confidence that he has full understanding of the problems confronting the operating personnel.

The job of scheduling is one best performed by the production manager in the small or medium sized factory. Usually it is up to him to work out his own salvation, and by various means evolve a method of more or less exactitude that will keep the front office kicks down to a minimum. His problem lies not only in the technic of machine loading, man-hours, material procurement, availability of tools, etc., but in the human relationships, the understanding of and consideration for the unusual situations. His is a constant study of men, to know when an unusual demand is the last straw and when it is the incentive that pulls a man out of a slump and sets him going with renewed vigor and interest.

Most scheduling and follow-up systems just grow and are built on experience. A first requisite to growing in the proper direction and in accordance with correct principles is an insatiable desire in the soul of the man responsible for this phase to profit by the experience of others, and to bring to bear on his own problems not only the light of past experience in his own plant, but that of every one else who cares to tell how he does it.

Ready-made plans may oftentimes prove to be a good basis on which to eventually evolve a truly effective scheme, and possibly in some cases solve the control problem in the first attempt with the most economical scheme that is adequately effective. However, constant study, elimination, substitution and improvement are necessary so that the system keeps pace with ch[illegible]ing conditions, such as product changes, success[illegible] equipment, and development of the perso[illegible]

Scheduling should be do[illegible]oroughly understands the entire sho[illegible] keeps in constant close touch with orders, and with the labor, t machine, and the material situation.

In general, the various classifications of product a scheduled in accordance with past output records. I class has sold during the past six or eight months a rate of $10,000 per month, then the normal schedu output should be $10,000 per month. If necessary exceed this figure, the shop superintendent should consulted to see if labor from some other class is ava able for transfer to this work. If so, the class fr which men are transferred should be scheduled less th normal until the emergency is past. If it later becor necessary to schedule a normal amount, or more, in t class, it should not be done until a thorough check made on men and machines and further transfers ma or men hired, or overtime authorized.

In operating under the method outlined in this arti adherance to the foregoing will result in shipping scheduled even in peak times. Disregard for these pr ciples will only result in the shop running into a jam w nothing but grief of delayed shipments, broken shipp promises, telegrams from and to customers and dist offices, breaking down of machine set-ups with result higher costs, special trips to the freight and express s tions, etc.

Satisfactory and wholly adequate results can be tained in many businesses without elaborate detailed r chine-load planning boards, operation job and time ti ets, standard operation costs, schedule charts, etc., sim by the use of some of the known principles of scient management applied broadly to the plant as a wh and departments in the plant or classifications of pr uct, either or both as the circumstances may require. I lars and cents figures, net selling price, can be usec scheduling where the labor is approximately proporti to the selling price. Whether in any individual case, labor is sufficiently approximately proportional to selling price can be determined by trial, that is opera scheduling on this basis for several months or a y Results are the proof.

The important thing is to make a start and gradu evolve the scheme that provides sufficiently accu (commercially accurate, as the saying is) results wit minimum cost,—that is labor of the one who schedu the cost department, the planning department, the fo men, time clerks, and finally but not least the direct la operatives.

Many control schemes transfer clerical labor and p ning work to the direct labor forces, who should be c pletely relieved of anything that detracts from ac producing. One function of planning is that of ser

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to the individual man on direct labor, and efficient planning will have fallen down if a man on direct labor must perform a task properly that of the planning department. What is and what is not properly that of the planning department must be determined and established by the management.

The greater the variety of product, either in type or in sizes or ratings, the more complex the problem. If all of the product is assembled from standard parts that are built, to stock the problem is comparatively simple, as the number of special parts increases the more difficult the control.

Records are kept to determine the average output in dollars of each assembly department and of each assembly group within that department if different groups produce a different product classification. Likewise the output of the plant as a whole is known. Knowing what the shop and what each assembly group produced in past months with a known payroll and how the inventory varied during that period it can be assumed that the future will show similar results unless the product is changed or the balance of the different classifications in output has been materially changed.

The scheduling man should be in constant touch with incoming orders, the amount of unfilled orders, amount of inventory, and payroll by departments.

A record is kept of unfilled orders in dollars against the shop as a whole and against departments or assembly groups. The distribution of the unfilled orders by shipping date must be such that all production periods (usually a week) are evenly scheduled full and not over scheduled without just arranging for overtime or more men. If a schedule becomes too long in the future so that excessively long delivery must be promised on new orders something must be done to increase output. Oftentimes transfer of men is necessary, other times overtime or hiring of new men is necessary, machine capacity may be the limiting factor. In each week's schedule, room must be left for the usual number of rush orders.

Only a small percentage of orders specify definite shipping date that are short promises. These can be definitely scheduled and the schedule maintained by close follow-up and the use of the "ship surely" notation on the shipping order. Other orders can be scheduled three or four days beyond the probable shipping date with the likelihood that they will be shipped ahead of schedule. Better to have the reputation of sometimes shipping ahead of schedule and always as scheduled than to promise short delivery and ship several days late.

Closer scheduling would entail detailed machine loading charts and assembly loading charts, which in turn necessitate operation time, standard operation rates, and cost keeping and time keeping by operations. All this adds to overhead which is unnecessary when ordinary hourly rates or group bonus are the wage payment methods.

Assurance that a limited number of urgent or important delivery orders are shipped as scheduled is accomplished by use of a periodic "Urgent-Overdue-Important order" last issued to the planning department. Effective and inexpensive check up is accomplished by pencil memorandum to the shipping clerk to return the memorandum when shipment is made. The carbon copy serves as a reminder.

The perpetual inventory records form the basis of the production planning system, in so far as control of material is concerned. On all items of finished and raw stores order points and order quantities are established. The order point is based on the time required to replenish stock plus a factor of safety. Where the stock in all stages plus that on order with suppliers reaches the order point, the purchasing department is given a requisition for the ordered quantity. Material is scheduled to arrive at a definite date. If not in on that date the purchasing department follows it up. At some lower stock condition the originator of the requisition places the item in the emergency follow-up class.

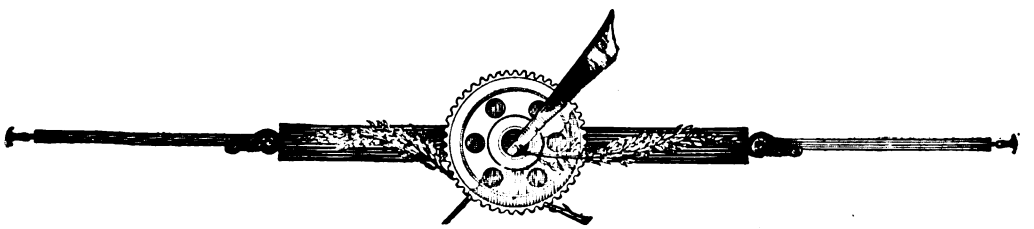
The emergency follow-up ticket is inspected by the manufacturing executive and the necessary correcting steps taken by purchasing agent if an outside purchase or by planning clerk if a shop job order.

An added safeguard against depleted stock and also over-stocking is a periodic check sheet on each classification of material monthly or semi-monthly, made out by the stock record clerk, inspected by the manufacturing executive and the necessary corrective steps by the planning clerk.

As a check against the shop being over-scheduled in the machine shop with probable later delays in assembly and shipping, a periodic check is made of all outstanding job orders in the shop for man-hours ahead. This is simply determined close enough for practical purposes from knowledge of the average total labor cost per piece and the average labor rate for the shop.

Bottle necks in production are analyzed from the standpoint of probable yearly load requirements, and, if the equipment is adequate, work is planned and scheduled far enough ahead to insure against a no-load condition.

Excellent results have been secured with the foregoing method of control in a factory of medium size, manufacturing a product assembled mostly from stocked standard parts and partly from special non-repetitive parts, all on a job manufacturing basis.



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Building Machines With Welded Steel

Interesting Applications of Steel to Replace Castings

By W. L. Warner

Industrial Engineering Dept., General Electric Company

CASTINGS of iron and steel have been used for various purposes for many years and they are still used extensively. Cast iron itself possesses a complex constitution which is subject to change with slight variations in manufacturing details. The structure is comparatively coarse and crystalline, and the metal possesses considerable hardness but lacks toughness. Cast iron melts readily and passes suddenly into a very fluid state. In this condition, it may be very readily poured into a mold and will make a quite perfect impression. Cast iron is non-ductile at all temperatures and cannot be deformed without being broken.

In machine construction, cast iron finds its widest field of application. No other metal which can be cast in complex forms can be produced with such ease and at so low cost. Cast iron has several competitors in this field, the principal ones being malleable cast iron, cast steel, and the cast brasses, bronzes, etc. Each of these materials possesses properties not possessed by cast iron, such as greater strength, toughness, or noncorrodibility. They are also more expensive. However, in the past w[illegible]onditions of service have been such that cast ir[illegible]them, it has had no competition, but the advent and development of fusion welding l given a new aspect to this situation.

Consider for a moment the physical properties cast iron. These properties are dependent upon so ma variable facto such as found methods, design a size of casting, co position, and form in which various constitu parts exist in iron that it is v difficult to make general statem concerning the We may say, ho ever, that the u mate tens strength vari from about 16,5 lbs. per sq. in. the soft gray i to approxima 35,000 lbs. per in. for the h gray iron. yield points a found to vary fr about 5,000 lbs. sq. in. for the iron to appr mately 22,000 per sq. in. for hard iron.

No constant r between stress strain exists for considerable interval and, th fore, we ca rightfully say cast iron has a r ulus of elasti The percen elongation is s for all cast i and very seldom ceeds from 3 to 4 per cent. The reduction of ar usually too small to be noted. The factor of sa usually employed in the design of iron castings is a seven and the safe working stress of cast iron in ten

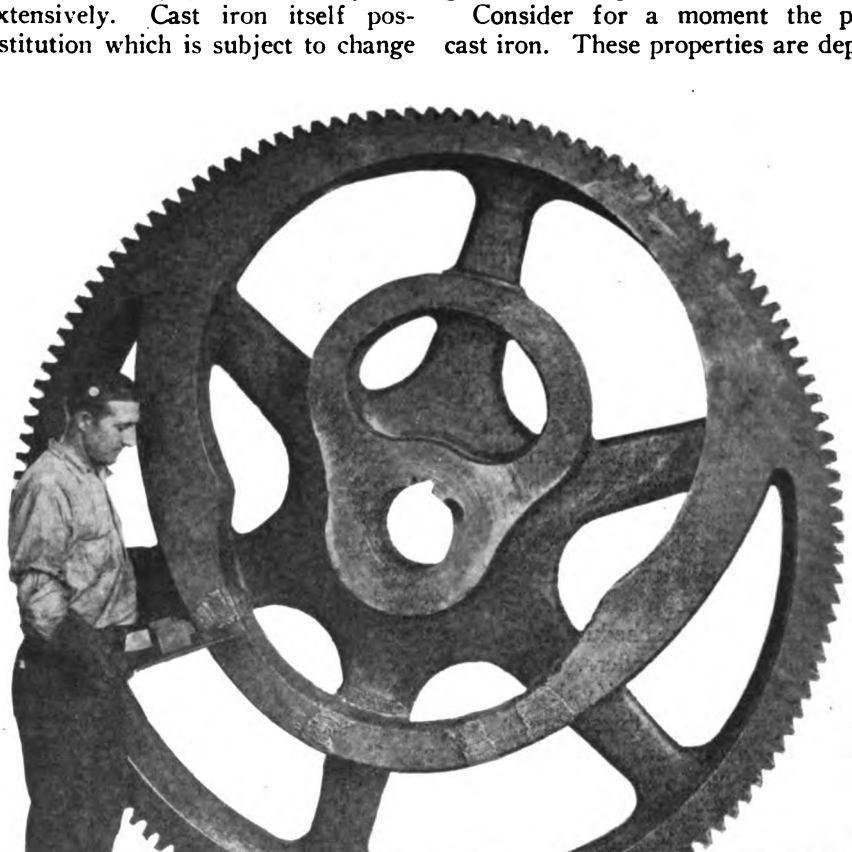


Fig. 1. Cast iron gear after repair by welding.

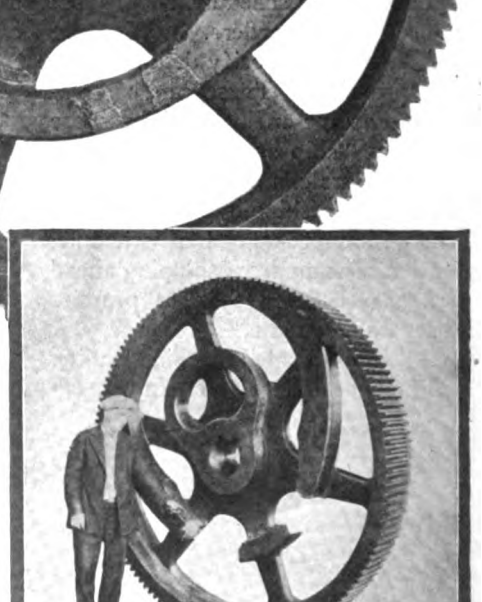


Fig. 2. Broken cast iron gear from 316-ton draw press before repair.

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is generally considered to be about 3,000 lbs. per sq. in.

The compressive strength of cast iron is also subject to wide variations. The factors which control compressive strength are exactly the same as those which control tensile strength. Under pure compression, the ultimate strength may vary from 50,000 lbs. per sq. in. up to approximately 150,000 lbs. per sq. in. For short blocks, the safe working compressive stress is usually assumed to be about 16,000 lbs. per sq. in. For other shapes, this value may be reduced 50 per cent. or more depending upon the ratio of length to radius of gyration of the cross-section.

Malleable cast iron is cast iron of special composition which has been rendered malleable by a process of annealing. The iron used must be a white iron with the carbon almost wholly in the combined form so that the annealing operation will result in the conversion of the combined carbon into free carbon in an amorphous condition, with no resemblance to free carbon in the crystalline form as graphite. Under this condition, the amorphous carbon will exist as isolated particles in a continuous mesh of metal. In this way, the casting is rendered very much tougher than white or gray cast iron and its ductility and malleability are increased to such an extent that it may be bent or twisted to a considerable degree even when cold.

The average ultimate tensile strength of malleable cast iron usually varies between 40,000 and 50,000 lbs. per sq. in. The elongation is seldom less than 2½ per cent. and may amount to as much as 7 per cent. While no quantitative data concerning its shock resistance are available, malleable cast iron has long been considered to be especially adapted to use where oft repeated light shocks are encountered. In this respect, it is often considered superior to cast steel. Malleable iron is especially useful in the manufacture of that large class of articles whose form is too complicated for economical forging, but which must possess a strength and toughness not attainable in gray iron castings.

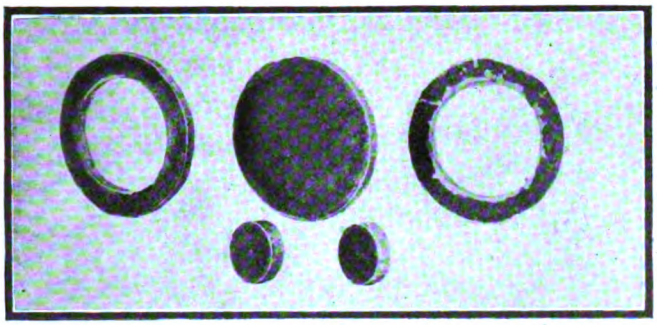


Fig. 3. Parts of rolled steel plate for gear wheel.

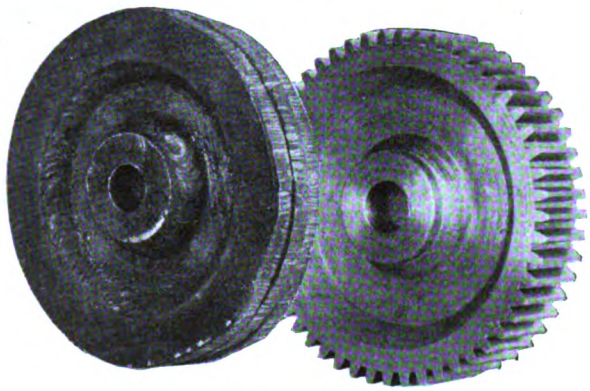


Fig. 4. Gear blank of rolled steel with parts welded together.

Fig. 5. Completed gear of rolled steel plate material.

It is interesting to note that iron in some form or other has been known and used by the human race to some extent ever since the dawn of history. The Egyptians were users of wrought metal and Herodotus tells us in the fifth century B. C. that the Medes and Persians were users of iron and steel. In most cases, however, the steels in use during that period of the world's history were essentially that we call wrought iron today.

If we investigate the historical development of modern iron and steel founding, we find that the first use of cast iron commercially occurred about 1468 and the first iron stove appeared in 1474. The process of iron founding as a business started about 1500. Various methods were used and improvements were made until almost 150 years later or 1645 the first blast furnace in America was established at Lynn, Mass. In 1720, the iron industry started in Pennsylvania and thirty years later, we have record of the first cupola being used in England. A patent for a cupola furnace was granted to John Wilkinson in England in 1794. The cupola was introduced into Pennsylvania about 1820.

The development and extension of the uses of wrought iron continued from the latter part of the eighteenth century up to the invention of the Bessemer steel process

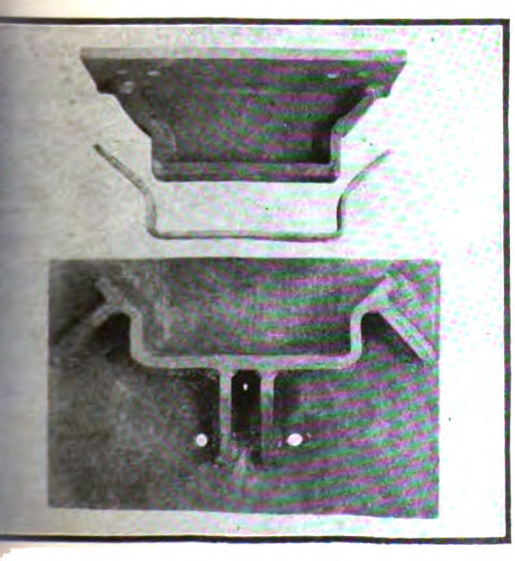


Fig. 6. A welded bulldozer die.

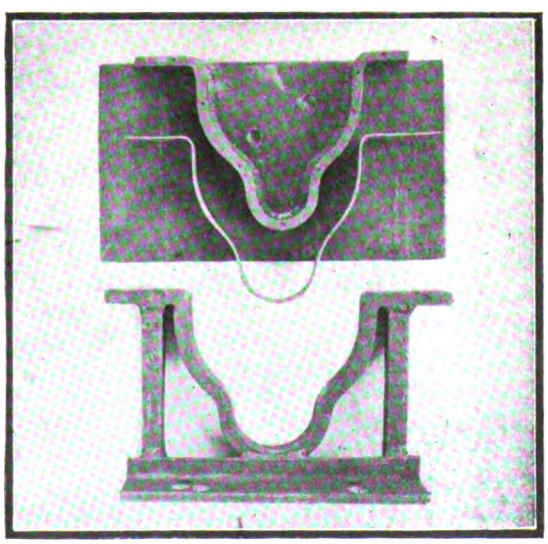


Fig. 7. Another example of a welded bulldozer die.

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by Sir Henry Bessemer in 1855. From this time on, the development and use of steel has extended into many fields crowding out the more expensive wrought iron and castings. The invention of the open hearth process in 1861 and inauguration of rolling mill methods in 1866 have assisted to a marked degree in this substitution.

The major developments of modern foundry and steel mill practice have occurred during the last generation, but we find the general principles fairly definitely established during the last twenty years of the nineteenth century. The pre-eminence of steel among iron products is indicated by the fact that about 75 per cent. of the total tonnage of iron products of this country is steel of one form or other. This figure may, however, be subject to correction.

The development of improved welding methods during the last ten years has placed at the disposal of steel and iron workers a process of joining metals which is rapidly revolutionizing industrial production methods. Welding is truly a steel founding process applied locally on a small scale. It renders possible the joining of metals in a satisfactory way with a minimum of time and labor expended in preparation and completion of the job.

By substituting rolled material for cast material, industry is following somewhat along the lines of past experience as suggested by our brief review of the development of iron founding methods, namely, the substitution of rolled steel shapes for iron and steel castings because of lower cost and improvement in physical characteristics. It is a common experience to find broken castings, machine parts broken in transit or service, or other castings having failed through some small defect which may have developed in service. In fact, for several years, the world at large considered welding as a process to be used only for repair work and the repair of broken machinery castings was thought of as the only great field of application for welding. Even now there are people who regard the welding process as a repair tool only and refuse to accept it for production work.

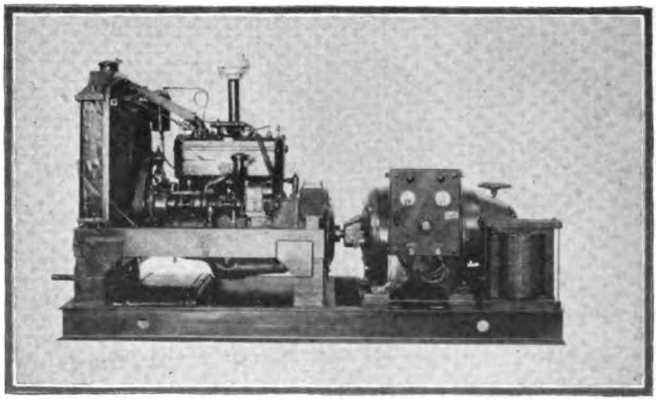


Fig. 8. A welded structural base for motor generator set.

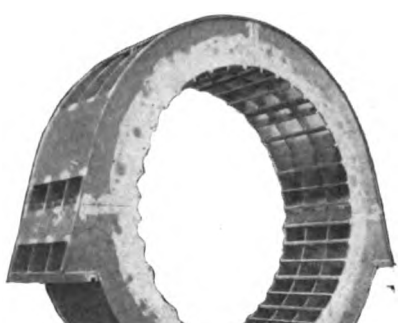


Fig. 9. Welded steel frame for synchronous condenser.

One thing is certain and that is that no one would take up welding on such a large scale as is being done at the present time unless there were some economic advantages to be gained thereby.

In the first place, the use of a rolled section instead of a cast section is always desirable wherever possible, due to a reduction of the amount of metal required for the same strength and stiffness.

The rolled section was originally a casting which has been reduced to its final shape by a process of mechanical working which has refined the grain structure and improved its physical qualities. Also, pound for pound, the rolled section is the cheaper, costing anywhere from two to four cents as against seven to nine for the casting.

There is less waste involved in the fabrication with rolled material than with castings and the number of machining operations is less. It is possible to fabricate within very close limits almost exactly to size while a certain allowance must be provided for in a casting due to shrinkage, roughness, and physical variations in the moulding operation.

The partial elimination of the pattern shop and pattern storage is another feature which is allowed by fabrication of rolled material. This item reduces overhead, the great problem of the factory cost department.

It goes without saying that the use of welding for fabrication with rolled shapes makes this development more attractive to the designer and fabricator because of

(*Continued on page* 30)

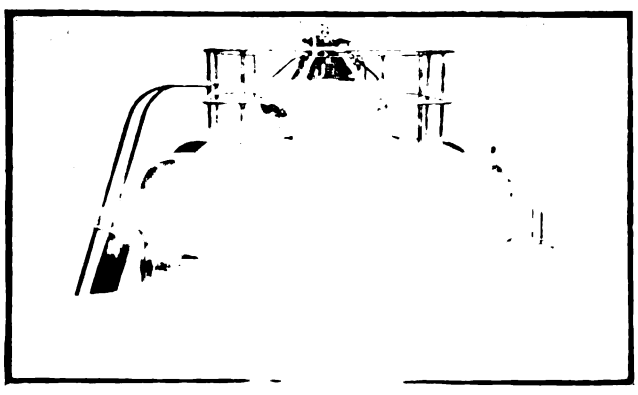


Fig. 10. Completely ... vertical water wheel driven gene... d frame and e...

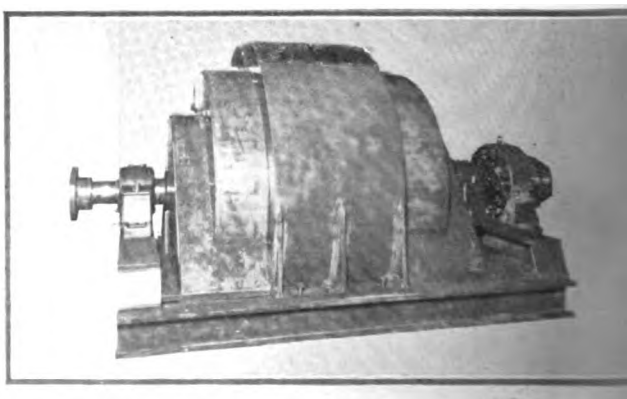


Fig. 11. Synchronous condenser with welded frame and base.

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Fig. 1. An airplane view of the Western Electrio Co., Kearny works.

A New Factory Comes to the Eas

Western Electric Company Plant at Kearny, N. J., Follow Policy of Manufacturing at Market

By Morgan G. Farrell

THE Western Electric Company has built, on the Kearny, N. J. meadow near the juncture of the Hackensack and Passaic Rivers, a new plant for the manufacture of telephone cables and switchboards, which represents the highest type of industrial construction and layout.

The 1,051,000 square feet of floor area in the buildings now in operation will be augmented by 255,000 square feet when additional buildings now in the course of construction have been completed. This will make a total of 1,306,000 square feet, and future development contemplates a further expansion of the works.

This is a gigantic addition to manufacturing enterprise even in the industrial district of Metropolitan New York, which embraces the territory within a fifty mile radius of Grand Central station.

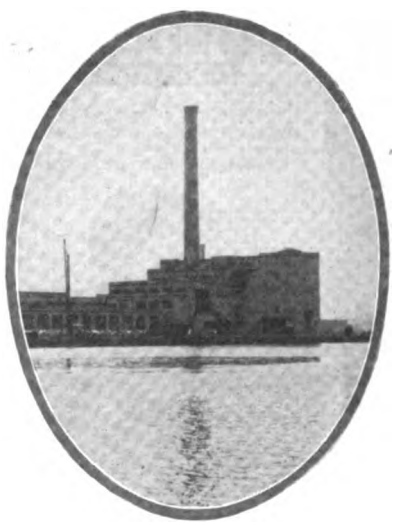


Fig. 2. The Western Electric Kearny works as viewed from the west banks of the Passaic River.

The site selected has already been developed for dustry. The Federal Shipbuilding and Drydock Co pany's plant and ways adjoin it the east, while the great Ford asse bly plant is its neighbor on the nor Nearby is the Shupe Terminal, f merly a depot of the War depa ment.

It is on the Newark division of Central Railroad of New Jersey, a has, of course, rail connections w all the other trunk lines which t verse the Jersey meadows to th terminals on the Hudson.

Buses connect it with the nea trolley lines and the more distant i ries and tubes. It is within all-l motor-truck haul of Manhattan. the new vehicular tube now be completed, which terminates at Ca and Varick Streets in New Yo The sources of labor supply incl nearby Newark and Jersey City.

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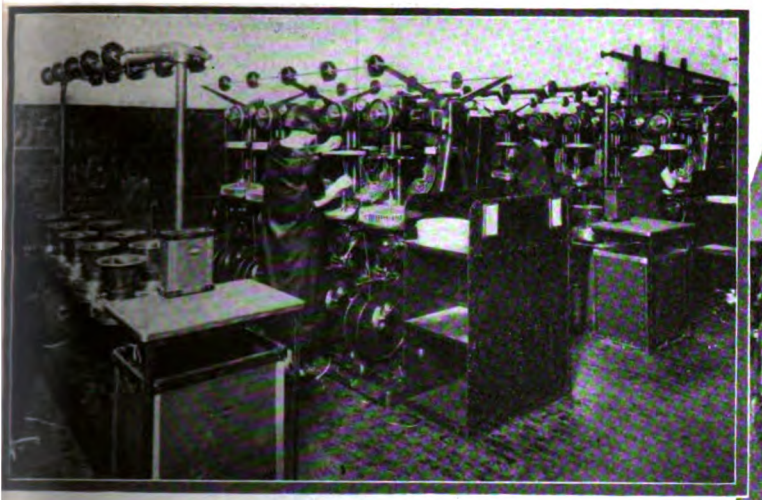


Fig. 3. Cable conductors being insulated at the Western Electric Kearny works. This is the first step in the manufacture of the lead covered telephone cables.

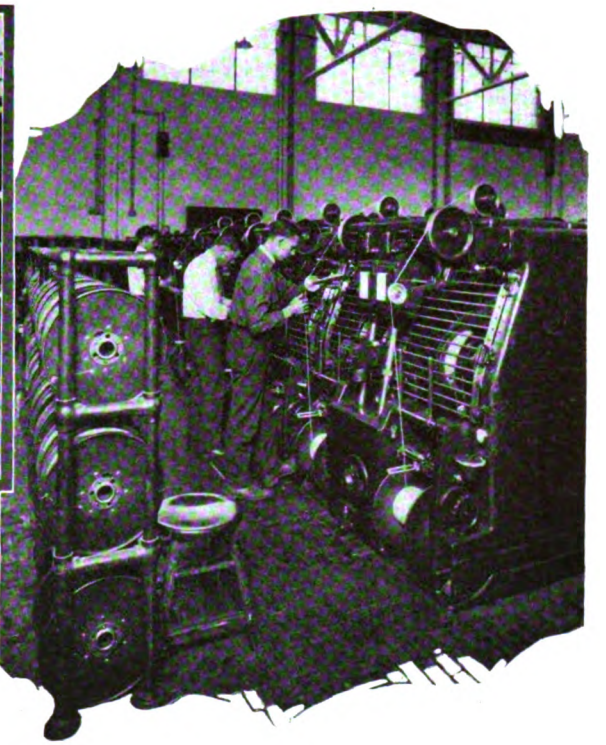


Fig. 4. The paper insulated wires are being twisted into pairs for lead covered telephone cable at the Western Electric Kearny works.

suburban home centers of Elizabeth and the Oranges, and the rapidly growing towns in Bergen County to the north.

These are important strategical advantages of location, for the plant employs nearly 5,000 persons of both sexes. The exigencies of manufacture of the company's products, require help of a far higher average intelligence than the usual factory hands.

Visitors to the plant are impressed by the earnestness, speed and efficiency of the workers. They are carefully selected and trained for their duties, while their further welfare is under the careful supervision of a trained organization of personnel workers.

R. C. Dodd, works manager, is at the head of the Kearny organization, which, with the Hawthorne works at Chicago, constitute the principal manufacturing plants of the Western Electric Company, devoted to the manufacture of telephone, telephone cable and telephone apparatus for the Bell system.

The sixty-acre Kearny site was selected from a total of forty-two under consideration, title being taken on February 9, 1923. The first pile was driven on July 11, 1923, the start of a building program which included in its first phase the construction of the one story cable

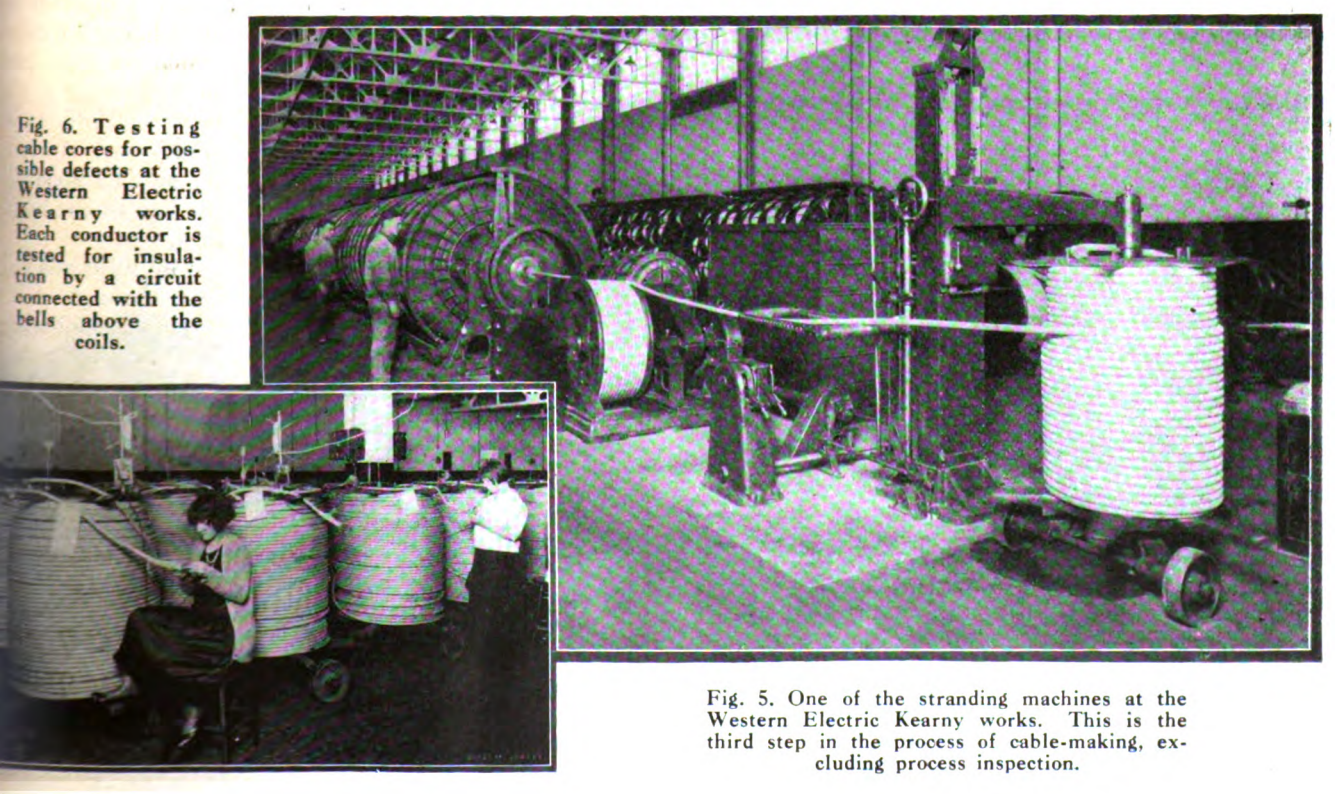


Fig. 6. Testing cable cores for possible defects at the Western Electric Kearny works. Each conductor is tested for insulation by a circuit connected with the bells above the coils.

Fig. 5. One of the stranding machines at the Western Electric Kearny works. This is the third step in the process of cable-making, excluding process inspection.

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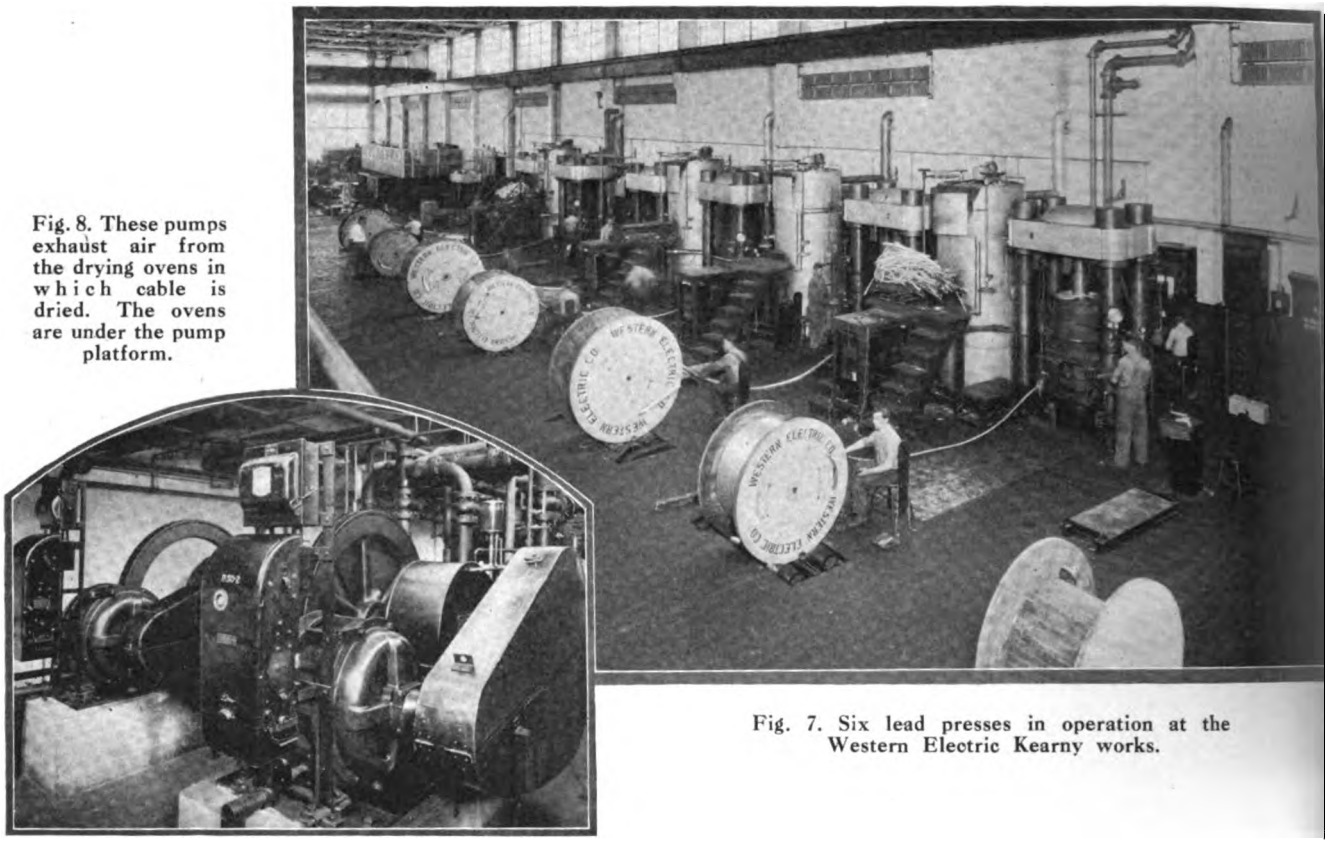


Fig. 8. These pumps exhaust air from the drying ovens in which cable is dried. The ovens are under the pump platform.

Fig. 7. Six lead presses in operation at the Western Electric Kearny works.

manufacturing plant in six connected units totalling 205,000 square feet; the building of a power house whose eventual capacity will reach 20,000 k.w.; a crude oil "cracking" plant for the generation of gas, including an accumulator or gas tank; and, what was perhaps the outstanding achievement, the construction of a timber cribbed mass concrete bulkhead 1734 feet long to keep the thousands of yards of cinder fill in and the Passaic River out.

All this was completed by March, 1925. With this ambitious schedule under way, in the fall of 1924, the second phase of the construction was undertaken; the construction of a group of six story buildings totalling over seventeen acres of floor space. All were complete by June, 1926, and represent the main portion of th present plant. The plant is the last word in advanced in dustrial design of the most fire-resistive type. It is o steel framing, encased in terra cotta fireproofing, wit buff face brick exterior and heavy reinforced concret basement and first floor slabs. The sixth or office floo is of terra cotta tile and concrete joist construction wit a finished concrete floor under the topping of battleshi linoleum. The manufacturing floors are supported b terra cotta arches, the surface treatment being 13/16 i maple on 1 in. pi underflooring. Th heavy traffic ais spaces are 1-11/ in. maple; good f the life of the buil ings.

The walls and ce ings throughout a painted in mill-whit The heating syste is hot water, and t plumbing fixtures a of the most rugg and serviceab types. There is plentiful supply

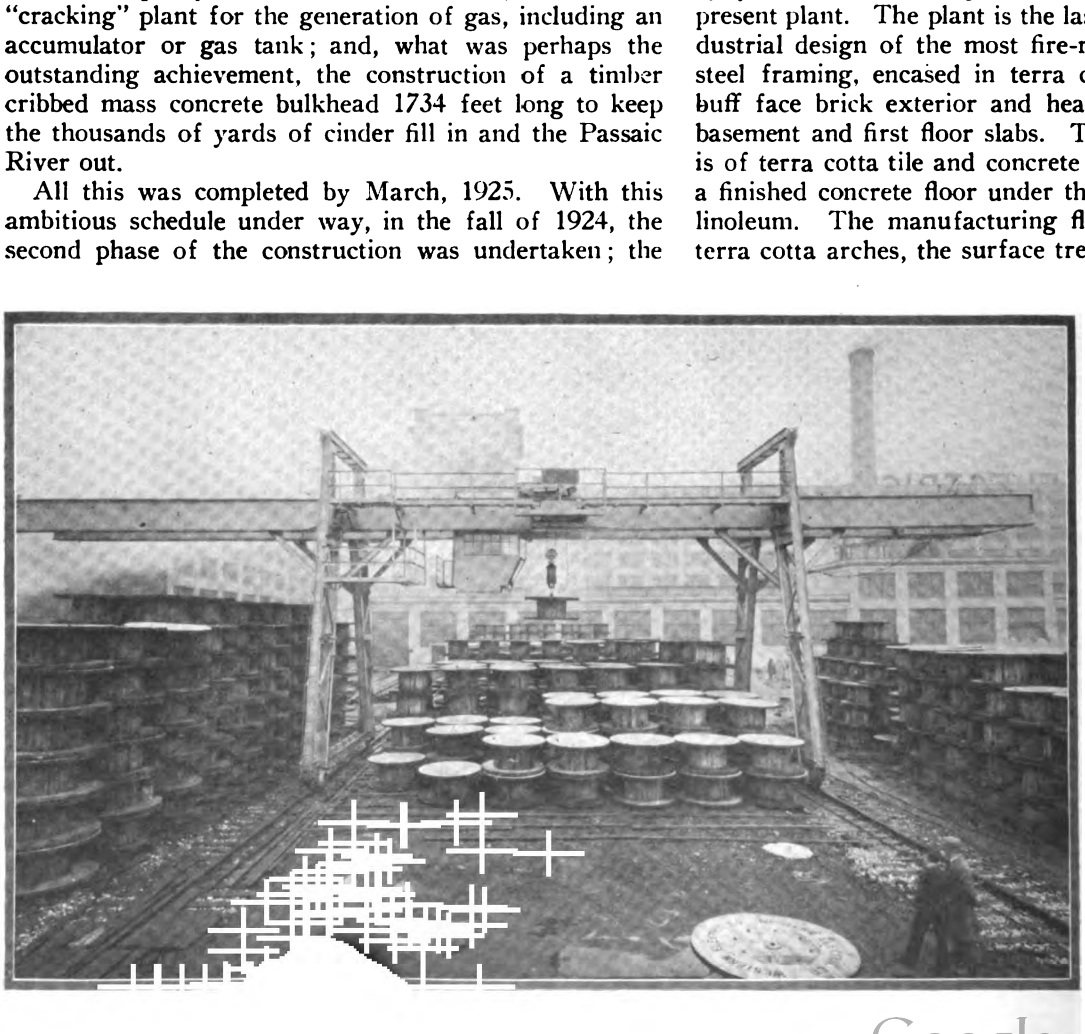
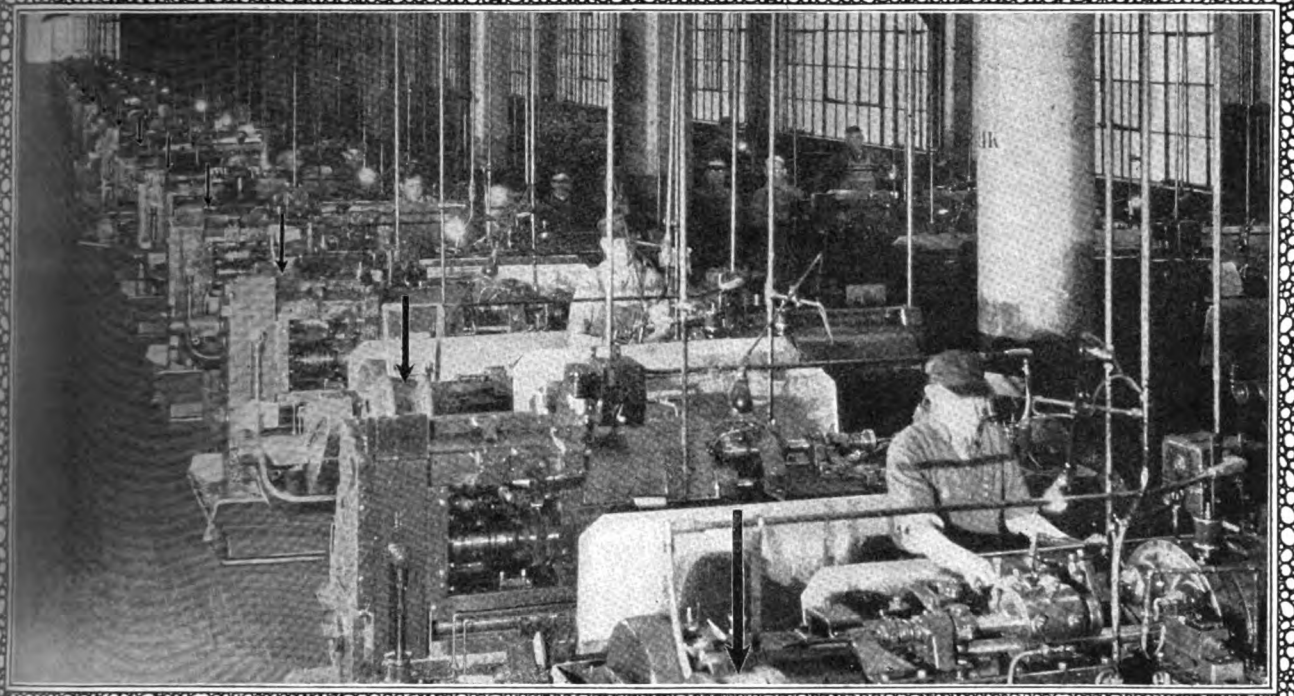


Fig. 9. The gantr crane in the yards o the Western Electri Kearny works. Re turned spools awaitin reclamation in th wood shop.

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A partial view of one hundred and six "automatics" operated by as many New Departure Ball Bearing equipped General Electric motors. These have been in operation from 8 to 10 hours per day for 20 months without adding to the original lubricant placed in the bearing housings by the motor manufacturer at the time of assembly.

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New Departure Quality Ball Bearings

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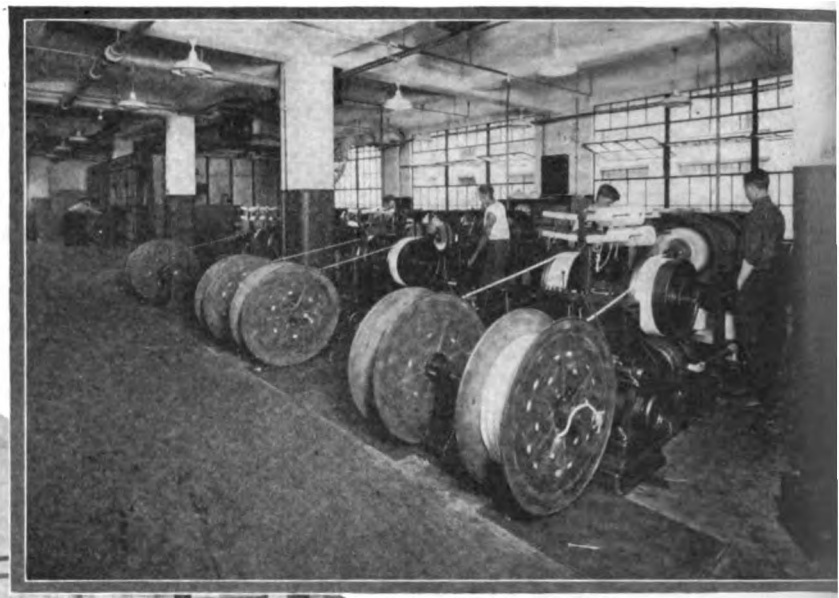


Fig. 10. Wrapping tape on switchboard cable. The drying oven is shown at the left.

Fig. 11. The operators are soldering ends to the distribution blocks for the cable which connects all the panels of a central-office exchange.

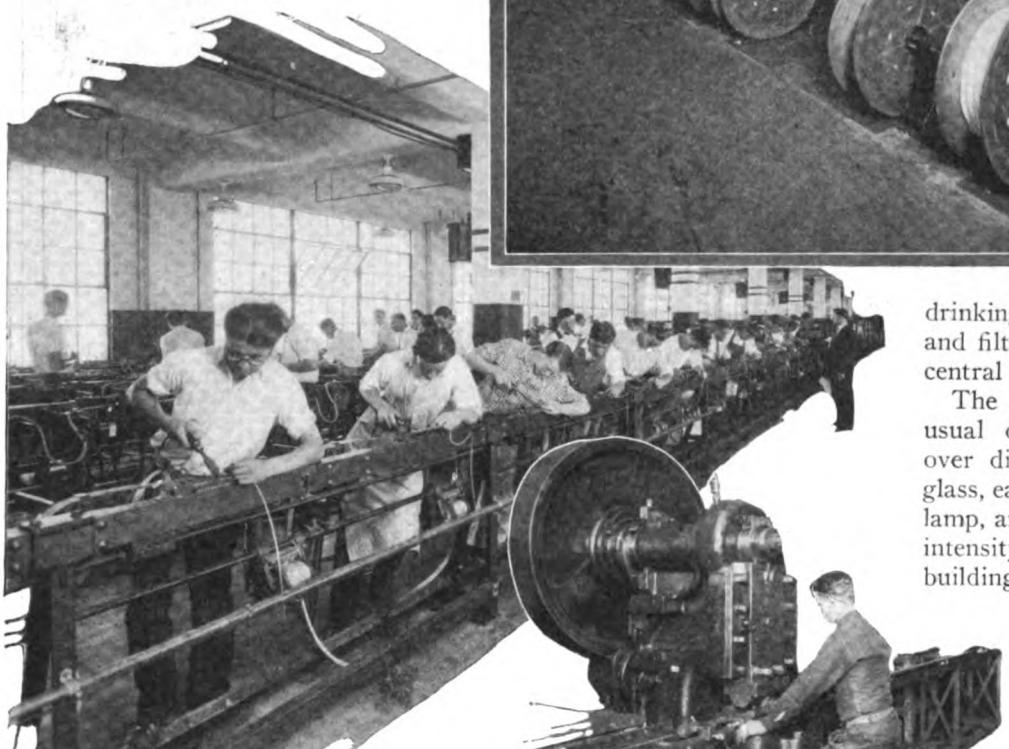


Fig. 12. Metal shop in which the parts for the steel framework of telephone switchboards are fabricated.

drinking fountains, to which cool and filtered water is pumped from central plant in the power house.

The lighting fixtures are of u usual design with metal reflecto over diffusing globes of transluce glass, each of which houses a 200 wa lamp, and at bench level gives a lig intensity of 12 foot candles. All t buildings are fully equipped wi sprinklers, and are bu with ample fire cut-o walls, and served by nume ous fireproof stairways a spacious elevators.

The power house and i equipment are equal to t best public service stan ards. Coal is unload either from the barges cars, and dumped as need into track hoppers, when it is carried by bucket co veyor to the bins over the boilers. They have a capaci of 800 tons. The coal is fed directly to the chain-gra stokers feeding the present four 900 hp. Babcock & W cox boilers operating at 300 pounds pressure. Pro sion has been made for a duplication of this battery.

Fig. 13. A scene in the iron working department at the Western Electric Kearny works. Assembling the switchboard frames.



The brick stack is 200 feet high and 12 feet 6 inc inside diameter, but it rests on the steel work of t power house, its base being 90 feet above mean l water.

The bucket conveyor is also used for ash remo since it passes under the ash doors of the boiler sett and discharges in bins adjacent to the cool bins a the boilers. Ashes are loaded for removal by grav directly into gondolas from these bins.

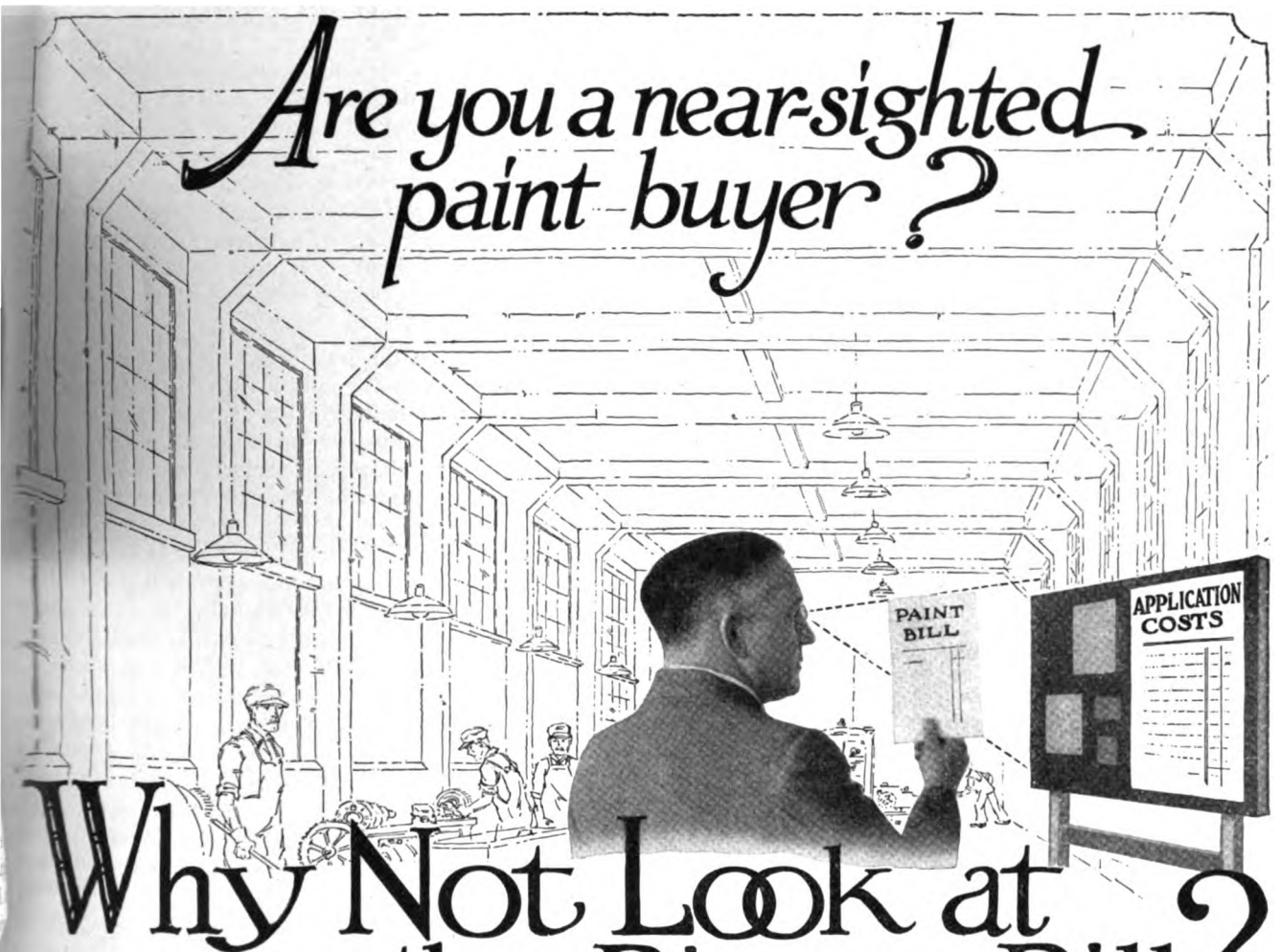
The turbine room, lighted by monitor skylights, a 12-in. by 12-in. Welsh quarry tile floor. In it are 1,500-kw. and one 5,000-kw. Curtis steam turbi assembled with General Electric alternating current g erators. Eventually, the power equipment will inc three 1,500-kw. and three 5,000-kw. units.

There are two exciter units and two boiler feed pum

(*Continued on page* 34)

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Cleveland, Ohio

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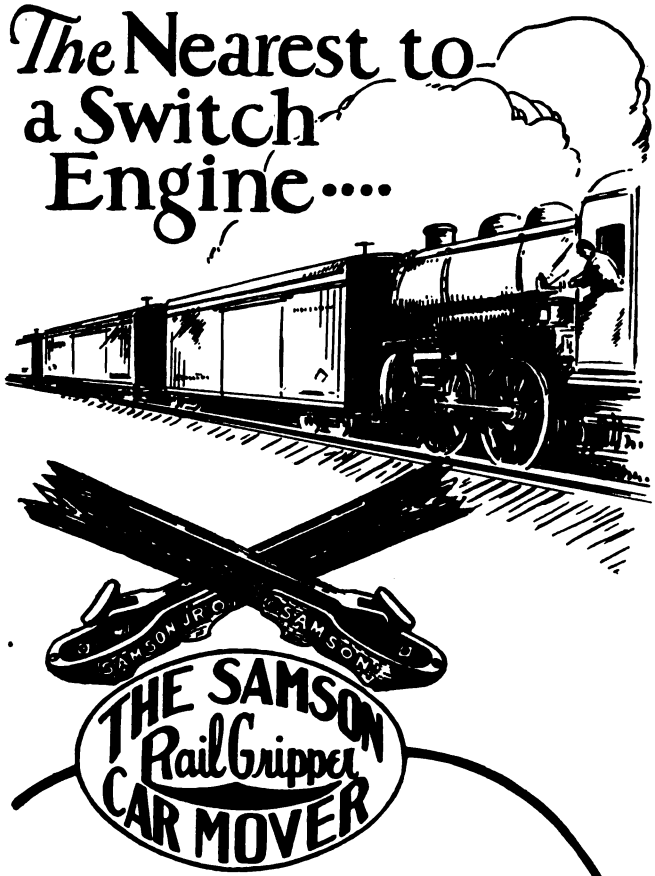
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(Continued from page 22)

the flexibility of the process. Rivets could be used u doubtedly but when one considers that it is necessary work on both sides of a joint to rivet and requires fr two to four men, while welding necessitates one m working from only one side with the resulting eliminati of secondary connecting shapes, such as angles, pla etc., the process of fabrication by welding becomes m attractive than ever. If changes are necessary duri construction, how easy it is to cut out and fit in pieces make the change, while, with a casting, a new mold usually required.

There is also the possible chance of using automa welding machines for this work and this procedure ways makes for reduced costs as is evidenced by the g eral trend of industrial processes at the present ti The welding machine will perform continuously with tiring, while the manual welder requires a certain amo of relaxation and relief from holding the arc over l periods. Also the problem of labor turnover becon less acute where the main dependence is placed on m chines for performing routine jobs.

It must not be supposed from the foregoing disc sion that the substitution of welded fabricated sha for castings is taking place without being confronted complicated problems. The problems of expansion a contraction, type and design of weld, size of plate, j and fixtures, amount of weld, and methods of assem necessitated a very careful study. These have, howe been quite successfully solved which is another proof t the old axiom, "Where there's a will, there's a wa still holds good.

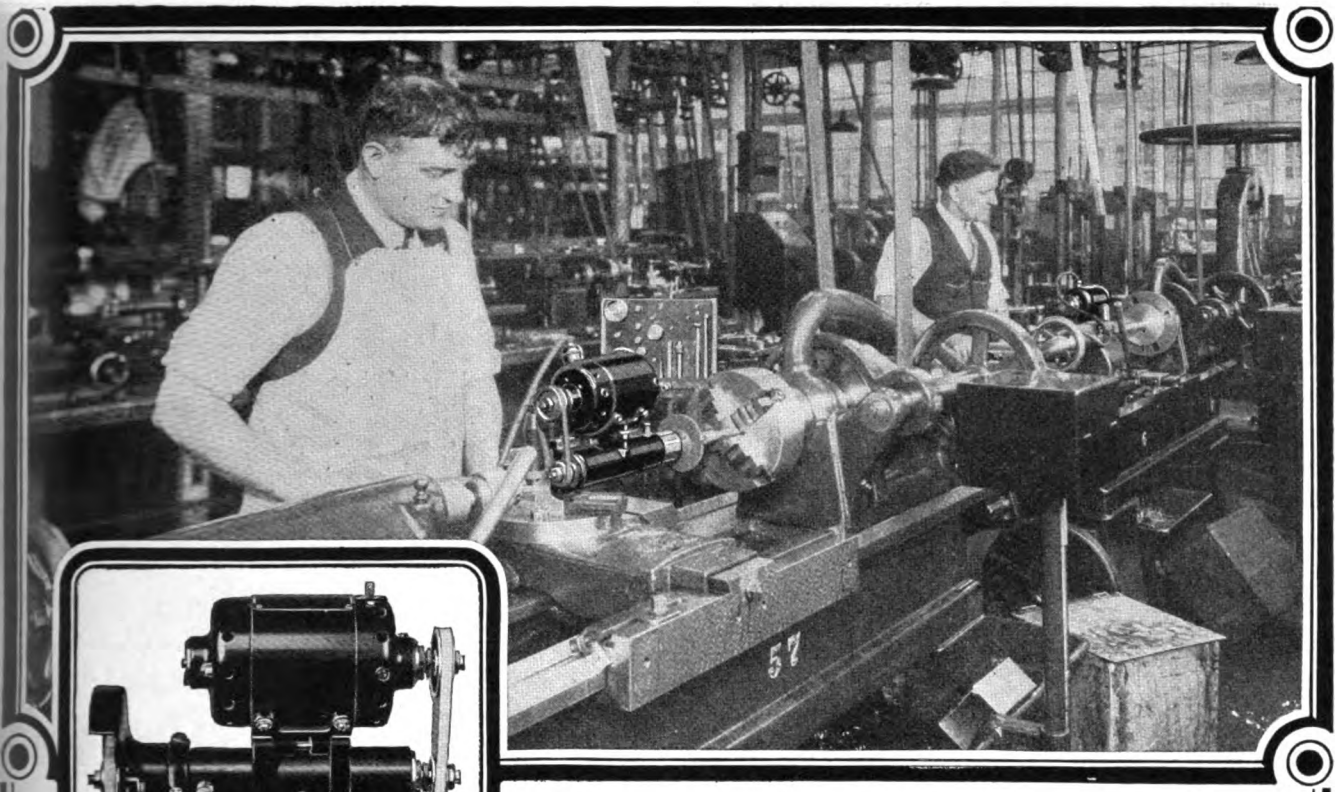
As an example of some of the simplest applications welding to repair of machinery parts Figs. 1 and 2 sh the repair of a cast iron gear wheel. In the methods lowed no preheating or annealing were necessary, steel studs were used to hold the replacement parts position.

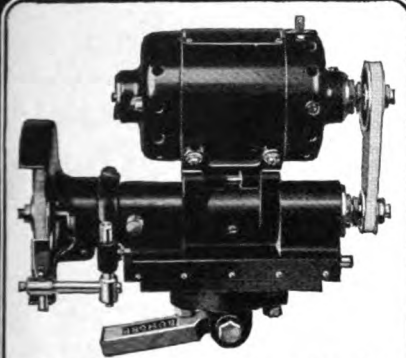
The use of automatic welding machines for perfo ing routine welding operations is always desirable wh ever the nature of the product is such that the work setting up does not consume more than approxima one-third of the total time required to complete the w job. This condition is, however, relative only and sh not be considered as a hard and fast rule. Figs. and 5 inclusive show a method of replacing gear cast by rolled steel plate. The parts are cut from flat ro steel plate by an automatic gas cutting machine and put together with an automatic welder.

Sometimes it is possible to build up forming dies use in metal presses by welding. When this is d considerable—if not all—machine work may be eli ated. Figs. 6 and 7 show a variety of welded l dozer dies. These replace more expensive cast and drop forged dies.

One of the earliest changes from castings to we steel construction was on the bases for arc welding as shown in Fig. 8. This type of construction is lig and cheaper than the casting and stands up better u the rough surface conditions to which these machines subjected. Evidently, it is only a question of time be this type of construction will replace the majority cast base construction. Before this happens, how methods of design, welding data, and manufacturing tails must be very carefully worked out so that no a

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RA-TOX Shades are made from permanently stained basswood strips woven parallel with hard-twist seine twine. They definitely keep back sun-glare, yet allow for the free circulation of stimulating fresh air, without drafts. In addition, they admit ample light for the finest kind of manufacturing. Where steel sash is used, RA-TOX Shades are suspended from offset steel brackets, providing for independent operation of shades and center-swung ventilators. Over 20 years of experience has enabled us to make and perfect installation methods to meet all other shading requirements.

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tional labor or machine operations are required than a now required with the cast construction.

Perhaps one of the most interesting applications welded structural steel parts to the replacement of cas ings is the work which the General Electric Compan has been and is now doing with the stator frames electrical machines. The illustrations given represent t result of several years' work.

Fig. 9 shows a welded steel frame for a synchrono condenser. This frame is approximately 18 feet in dia eter and is built entirely of rolled steel plate welded t gether.

A completely assembled vertical waterwheel driv rator with welded steel frame and exciter bracket shown in Fig. 10.

Fig. 11 shows a synchronous condenser with weld steel frame and welded base.

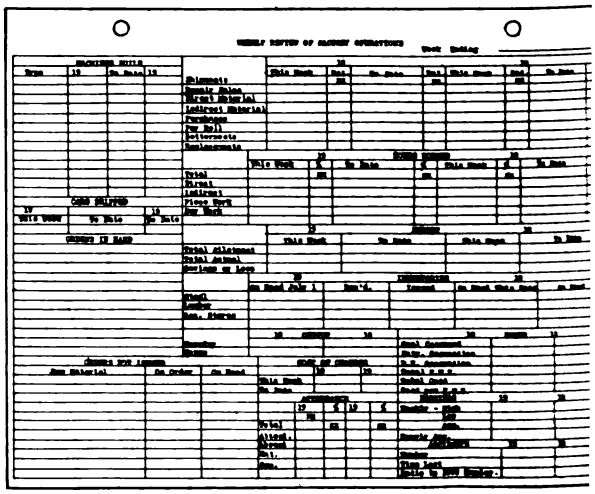
From the foregoing illustrations, it is evident that we ing is making possible some very startling changes methods of machine construction of various kinds. T activities in the structural steel industry at the pres time is further evidence of the awakening interest in t possibilities of the welding process, which, after all, but a new addition to the iron founding process.

A Weekly Review of Plan Operations

By S. J. Hopper

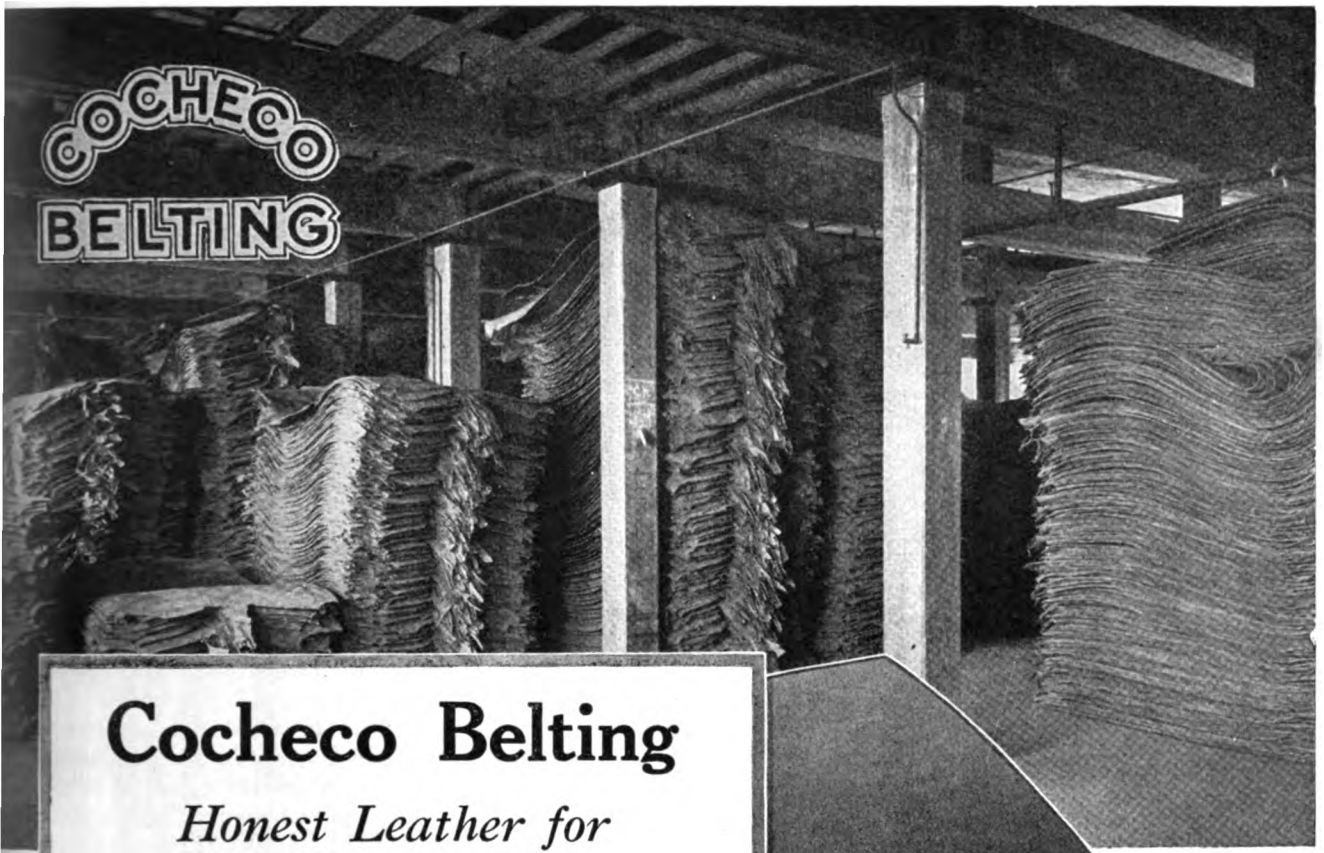
IN practically every plant there is a need for so kind of a report, issued either weekly or monthly, show just what has been accomplished. Many of th are more or less complicated, requiring an unnecessa amount of clerical work in their preparation. On other hand, some are so compiled that the informat they contain is of little value to the busy executive today.

The more simple these reports are made and the m information they contain the more valuable they will in studying plant operations. They should at least sh the amount of business done, the amount to be done a the costs of operation. These general heads natura lend themselves to sub-division into other items such the amounts of labor, materials and power costs. course, if desired, a report of this kind could cont many other divisions, such as those on the weekly rep shown in the accompanying illustration.



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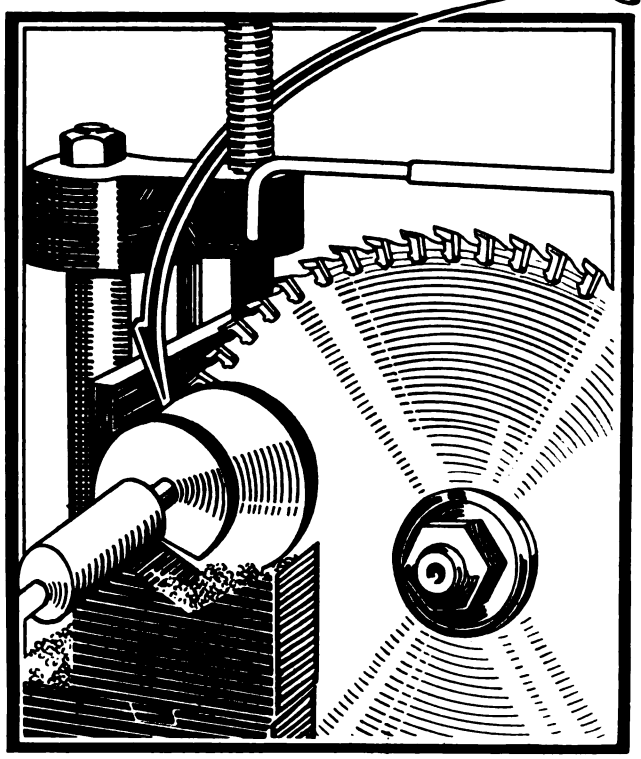
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St. John, N. B.

(*Continued from page 28*)

all turbo driven. Other auxiliaries are steam and ele trically driven, including the refrigerating machine, a compressor, house and vacuum pumps, hot water heatin system pumps, and the forced draft fans for the boiler

There are two chief manufacturing divisions—t cable shops and the telephone apparatus buildings. T first, being a heavy process in its latter stages, is laid o for horizontal production in one-story monitored buil ings arranged for a uni-directional flow. Switchboa manufacture, on the other hand, being a light proce except the wood cabinets, progresses vertically. T lightest parts at the top travel downward to meet t cabinets and metal frames fabricated on the lower floo

Consider first, the manufacture of the lead cover cables. These vary in size from small cables containi a few pairs of conductors of No. 19, 22 or 24 ga copper wire to the boa-like monsters of 1,200 pairs. T process, however, is the same for all of them.

Freight cars enter the end of the receiving shed t be unloaded. Coils of copper wire and rolls of pape insulation are taken from them and stocked, after in spection and testing, in standardized bins. Rejects ar immediately returned.

The first process is to wind the paper insulatio around the single strand wires in the machines devise for the purpose. After which the spools of paired wir go to the cable stranders to be woven into cable. Thes huge machines consist of a series of horizontal cylinde in the circumference of which hundreds of spools o paired wire are placed, the strand from each spool pas ing lengthwise through the core of the cylinder, bein turned with its fellows into one cable in the process. Fo the larger cables many of these cylinders are used, on after the other contributing their layer of pairs to th cable as it passes successively through their centers. Th rotation of adjacent cylinders is opposite so the fa like spread of the wires from each as they wrap arou the cable is reversed in each layer. The reels revolve opposite directions so that the lay of the wires will alternately right and left hand. The process starts wi a measured pair of wires whose strands form the core the cable and serve as a unit of measurement of l length. Passing through reel after reel the cable is bu up to the desired diameter, each layer being distinguish by its own color of insulating paper.

As the cable emerges from the last section of t strander, a final wrapping of paper is applied and t cable is wound on a spool. In the testing room ea wire of the stranded cable is now tested with an elect bell circuit for breaks in the wire itself or the insulatio The tested cable then goes to the driers. These are a tight cylinders which are heated by steam coils a which remove under vacuum all moisture from the pap covering. To prevent the dried cable from again taki up the moisture content of the air after removal fr the ovens, it is kept in the oven room until it is ready go to the presses which apply the lead covering, wh it is fed through orifices in the oven room wall.

The covering is a composition of antimony and le On account of the different melting points, a prelimina operation is necessary to produce pigs of alloy containi antimony and lead. These are thrown into the melti tanks with the proper number of lead pigs to give final proportion. The molten alloy is fed to the pres and slightly cooled. By the time it reaches the die

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TRADE **YALE** MARK

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Get the Right Yale Chain Block for Your Purpose

It is worth any man's time to find out what is the exact value and purpose of each type of Yale Chain Block.

Take the Yale Screw-geared Block for example. Of the many varied types made by Yale, including Spur-geared, Screw-geared and Differential, it possesses certain distinct features of its own.

Yale Screw-geared Blocks are unequalled for jobs where portability, lightness and strength are essential but where speed is the secondary factor.

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Yale invites correspondence which anticipates a full discussion and examination of hoisting and material handling equipment needs.

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THE WOOD SHOVEL AND TOOL CO. PIQUA, OHIO, U.S.A.

A mining shovel that will out-wear six or more ordinary shovels interest you, does it not?

Suppose, too, that it is much lighter because of the greater strength of the steel in its blade and that it can be more effectively used with less effort than any other make of shovel.

That would interest the miner and would be an added reason for trying H. K. Wood's Mo-*lyb*-den-um Steel Shovels which have every point of superiority over all other shovels that a *real* shovel can have.

Confidence in this superiority suggests comparative tests wherever the use of ordinary shovels must be a source of unnecessary expense. A request is all that is required and you will have the opportunity to decide between *Moly* effectiveness and durability and ordinary shovel trouble.

THE WOOD SHOVEL AND TOOL CO.

Piqua, Ohio

Mentioned in this issue write Industry Illustrated

is in a plastic state and is forced through them under a pressure of 55,000 lbs. per sq. in. surrounding the incoming cable. As the sheathed cable emerges from the presses it is wound on drums ready for the final tests and inspection.

The process of manufacturing the switchboards is more complicated. To start with the bulky materials such as cars of green lumber, mostly mahogany and maple enter the main floor of the multi-story buildings, where they are unloaded. The lumber is stacked on low kiln cars and rolled on the transfer table which brings the stack to the kiln. There are five dry kilns with a capacity of 10,000 feet board measure a day.

After seasoning, the lumber passes through the saws, planers and edgers on the first floor, thence to the finishers and sanders on the second floor and from there to the third floor for finishing, priming, rubbing, etc., and assembling.

The steel framework follows a similar route to the assembly floor.

Meanwhile the materials which go into the switchboard; cables, cotton, silk, tinfoil, paper, dyes and paints have been assembled at the first floor level and processed on the second floor. At the same time the tiny parts forming the various coils and relays have been put together on the upper floors, mostly by hand and bench operations, so that all are ready for assembly in the finished switchboards on the third floor.

The classes of switchboards manufactured at the Kearny plant are:

(a) No. 1. Central office type as used in main telephone exchanges.
(b) Small multiple boards for minor public exchanges.
(c) P. B. X. or private branch exchange boards for hotels and offices.
(d) Monitor boxes for small offices having only a few trunk lines.

It may be added that exactly the same skill, quality, material and workmanship enter into the manufacture of each of these types.

The Kearny works also has a generous space allotted to the executive offices, not only for the operation of the plant itself but for the merchandise and production departments whose function it is to translate customers' orders into terms of production and for other departments generally concerned with the operation of the works.

The whole plant is so built, equipped and managed that it offers to the entire manufacturing industry a model for all its achievements.

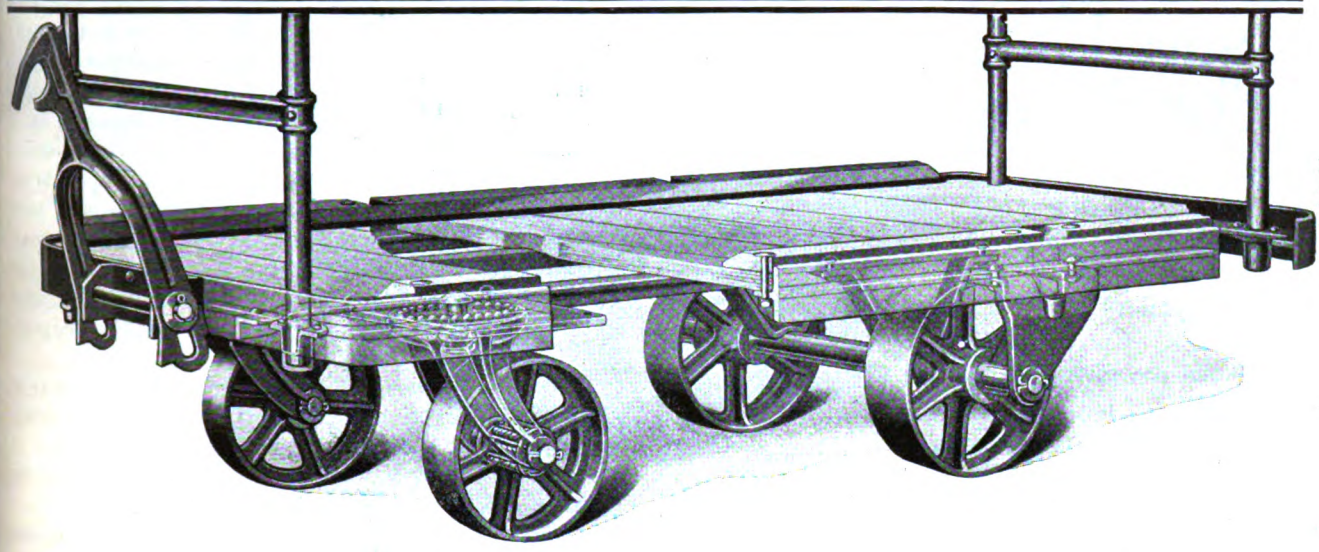
BUSINESS activity has followed a fairly even course during the last few weeks, states the current issue of the "Guaranty Survey," published May 31, by the Guaranty Trust Company of New York.

"Moderate curtailment, strictly in line with the seasonal tendencies that have largely dominated business movements in recent years, has appeared in basic industrial operations," the "Survey" continues. "Wholesale trade has likewise declined, while retail business, which was only moderately active in March by reason of the unusually late Easter season, has come into its own in recent weeks. On the whole, current developments tend to favor the continuance of trade and industrial activity at high levels, with month-to-month changes determined mainly by seasonal factors."

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Cut-out view to show important constructional features—for more details ask for Bulletin A-100

Mercury "A-310" Industrial Trailer



—To serve you best—

When you come to Mercury for your trailer needs you can expect — —

A product that is right. Built by the pioneer, with a background of more than twelve years experience. Carefully engineered—perfected in each last detail—the recognized "standard of merit" wherever trailers are bought and used. (Note—more than 20,000 of the Mercury "A-310" now in service).

Flexibility to meet your every need. Platform widths (30″ to 48″) and lengths (60″ to 108″) to suit. Hitches and couplers—rigid, chain, or automatic as desired. Steel, rubber-tired or wood wheels. Gravity dump or box bodies can be mounted on the standard chassis. In a word—we can give you anything your particular problems require.

Prices and deliveries that please. Our volume of business enables us to buy all raw materials in quantity lots at rock-bottom prices. Production processes have been brought to a high state of efficiency. And—if you need trailers in a hurry we can ship up to several carloads in less than a week.

—and the Mercury Tractor is in every respect the equal of the trailer. Request Bulletin No. 106



TRADE MARK REG. U. S. PAT. OFF.

Request our price list and scale of discounts and you will be agreeably surprised to know the figure at which you can buy this good, sturdy, well-built "all-steel" trailer.

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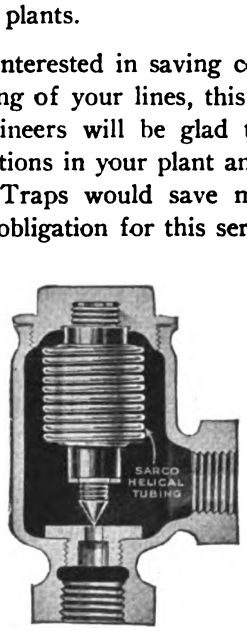


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Sarco Steam Trap No. 9 costs only ⅓ price of heavy traps of equal capacity. Sold on 30 days' free trial.



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Industrial Tests Show Material Weaknesses

By Donald A. Hampson

EVERY progressive manufacturer is on the lookout for new designs, new ideas and new materials. Three objectives might be named which stimulate this constant search and research, such as increased selling power, bettered product and greater profits.

However, it is the part of wisdom to investigate thoroughly before tooling up for something new and untried; before going into extensive selling campaigns. To put upon the market an article that hasn't had all the "bugs" worked out of it or that isn't going to stand up for a reasonable time is simply to court financial disaster. "Look before you leap," is an adage that applies to industry in these days as truly as it did to one's more homely affairs in decades that are past. It is for some of these reasons that some large concerns maintain vast plants devoted exclusively to research and development and thereby are enabled to put out new or improved products without disastrous results.

The policy of making a change merely for the sake of a change and of giving salesmen something new merely for them to be able to hold the prospect's attention by its novelty cannot be called sound in modern industry. There is a certain city that is known as the state's "hard luck town" because of the number of industrial failures that have punctuated its automotive ventures. The factories made good cars and others made good accessories but they never let well enough alone—they always changed. Not content with bringing out yearly models they changed bodies or engines in the middle of a selling season, thus breaking down production schedules, using vast sums for new tooling, and throwing dealers in despair because of the impossibility of selling cars that stayed up-to-date for a reasonable time or that were possible to fit with repair parts.

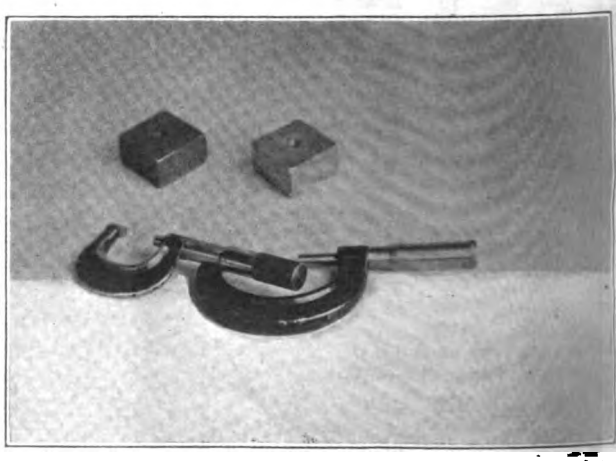
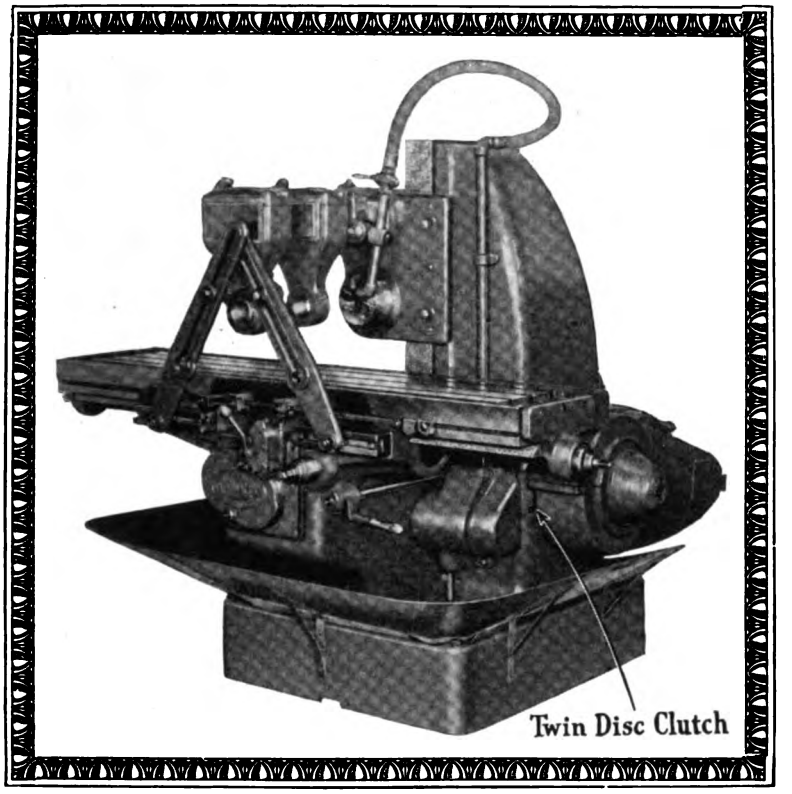


Fig. 1. Such metal blocks as these are used to mount printing plates. Their requirements are accuracy, permanence, strength under pressure, resistance to the action of acids and abrasives and lightness.

Contrasted with such unbalanced methods are those of industries which keep abreast of the times but only make changes after exhaustive tests have shown them to be for the betterment of the trade. The illustrations show certain simple tests—tests of whose truth there could be no doubt—that were made upon a product of an appar

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Rockford Rigidmil



With Twin Disc Clutch

A PART OF THE MACHINE

EVERY Twin Disc clutch used in a machine tool is carefully engineered into its place, and given adequate reserves, both of work and safety factors.

Every part is made of the best material for the purpose, machined accurately to S A E tolerance limits.

All parts are closely inspected and must conform exactly to rigid standards before and after assembly.

Thus, Twin Disc Clutches meet the requirements of large and small machine tools and, because of quantity production, can be sold at highly attractive prices.

The help of our experienced Engineering Department is at your disposal. Send in your specifications or requirements.

PARTS STATIONS

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Buffalo, N. Y.—Edward W. Rode, 45 A. St.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Ave.
Cleveland—James R. Howell, 6715 Quimby Ave.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Ave.
Detroit—Whitney Brothers, 6464 Epworth Blvd.
Los Angeles—Coast Machinery Corporation, 406 E. Third St.
New York City—E. George & Co., Broome & Wooster Sts.
Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn Ave.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie St.
San Francisco—F. Somers Peterson Co., 57 California St.
Tampa, Fla.—Motive Parts Co. of Florida, Inc., 708 Twiggs St.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.
Philadelphia, Pa.—Maerky Machine Works, 240 Cherry St.



TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN



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Cleans All Deposits from Shop Windows

Cheaply—Quickly—Safely

no liquid to damage machines, tools or merchandise

The sun streams through windows that haven't been cleaned in years after one application of Sunburst Paste. Put on with cloth or brush the heaviest deposits come off quickly. Windows take on a lasting luster—require fewer cleanings. A moist, acid-less cleaner Sunburst is so safe you can wash your hands in it. A non-liquid it won't damage machines, tools or merchandise. Results are guaranteed. Try a barrel, ½ barrel or ¼ barrel with the understanding that your invoice will be cancelled if it does not satisfy you perfectly.

no acid

SUNBURST
WINDOW CLEANING PASTE

LIQUID WINDOW CLEANERS

We make several, each for a particular purpose. Also producers of Thesco Organic Cleaner, Soft-as-Silk Liquid Soap, Hexstercide Insect Killer, Hykotar Disinfectant—everything in Industrial Sanitation.

THE GERSON STEWART CORP.
3541 E. 76th St. Cleveland, Ohio

Parks shipping room saw
at a lower price!

was $75.00
NOW $60.00
without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

FILL OUT AND MAIL THIS COUPON

The Parks Woodworking Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.

You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.

Name .....
Firm Name .....
Address .....
City ..... *State*

The Parks Woodworking Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

ently very simple nature by a manufacturer whose polic has always been to let a good product alone until he wa satisfied that he had found a better one.

This product is one of their many but serves to poir out ways in which positive tests may be made with com paratively inexpensive means. Lack of this type of trad foresight had cost one industry over $100,000 during on of the cycles of sales popularity which attended a ver similar product having all the attractiveness of finis and appeal—a kindred to that of the paint which one sold the buggy. But, lacking the staying quality of th less attractive but time tried product, the new went ba after a few months of actual usage.

The blocks A and B in Fig. 1 are used in quantiti to mount printing plates. Their requirements are acc racy, permanence, strength under compressive pressure resistance to the action of alkalies, resistance to abr sion, and lightness. The matters of strength and abr sion being the ones which insure permanent accurac tests to determine these were in order. The streng was needed to resist both horizontal and vertical crus ing loads, the latter running into many tons, while th wear came from handling upon metal surfaces such press beds, from rubbing contact with others of the ma and from falls to concrete floors.

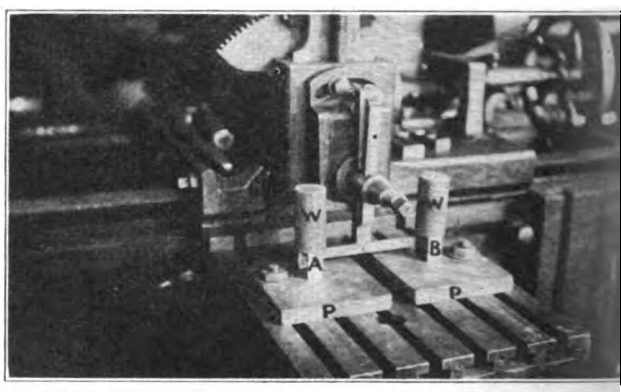


Fig. 2. Testing the blocks shown in Fig. 1. This is an abrasive test to determine wearing qualities.

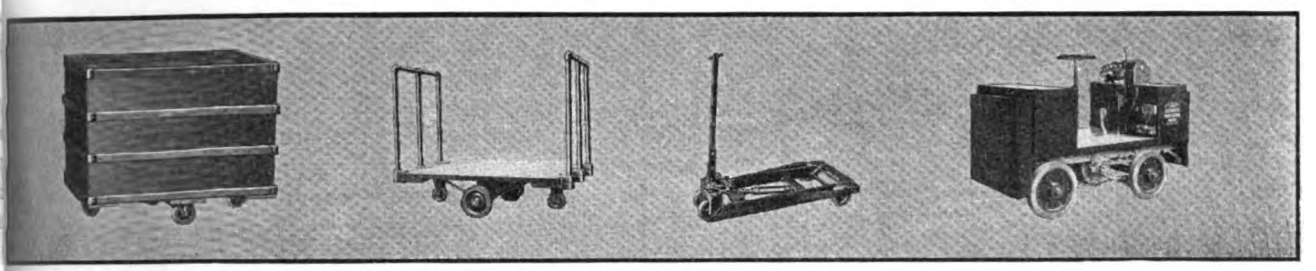
At the time the illustrations were made, tests were b ing conducted to determine the relative value of tw materials for this particular purpose, one of them bei grey cast iron produced under modern methods and t other an aluminum alloy specially compounded for possible substitution in place of the older metal. It w the policy of the plant to make no comparisons and draw no conclusions except as based upon facts of th own gathering.

The set-up of Fig. 2 is that of two blocks subject to the abrasion test. A and B are blocks of the t metals. They are lightly joined to a cross piece whi is in turn reciprocated by a bar held in the tool post a shaper which is set to operate with a stroke of 4 Two cast iron plates P correspond to the surfaces which the blocks will ultimately be used; hence the ba and-forth movement given corresponds to that of da usage and, to hasten the tests, there have been ad weights W on top of each block.

Twenty-four hours is the time allotted to these ab sion tests and in that time the blocks travel six mil After half of this "distance" is covered, the blocks changed to the other plates in order to even up any di ference in their hardness. As a result of this test, it w found that the iron block had worn down 0.001 in., ever

...t advertised in this issue write Industry Illustrated

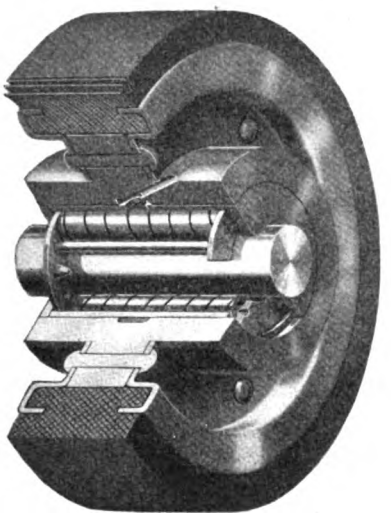
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DIVINE CANVAS CUSHION TRUCK WHEELS and CASTERS



Canvas Cushion Wheel with Swivel Steel Caster





Canvas Cushion Wheel with Rigid Steel Caster

DIVINE Canvas Cushion Truck Wheels are a positive protection to the finest floors. The tires of these wheels are composed of segments of canvas compressed under high pressure and held between steel side plates. Thus a "Cushion" of canvas is produced for the tread, which will not scratch or mar floors of the most delicate materials.

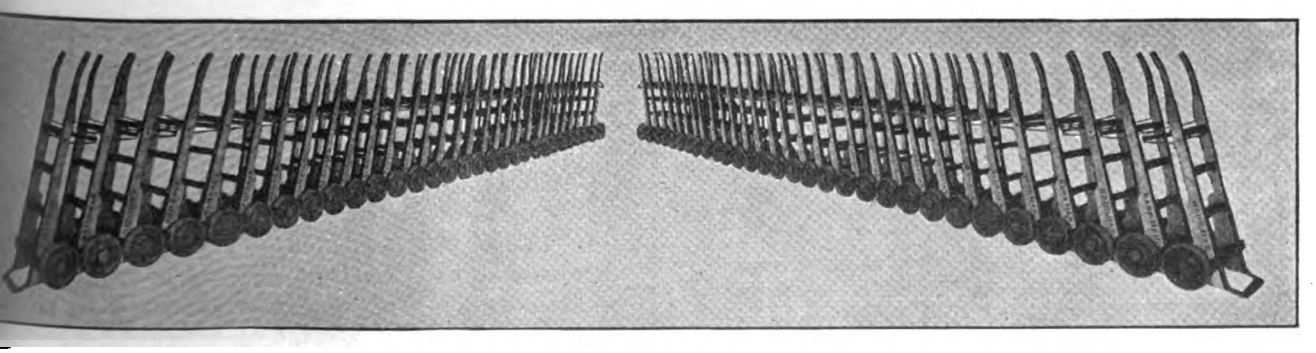
Divine Canvas Cushion Wheels are far superior to rubber tired wheels, because rubber tires chip, stretch and come off, or are torn to pieces within a short time. Divine Canvas Cushion Wheels are practically indestructible, do not deteriorate, and will last for years. The canvas cushion cannot stretch, spread, soften or change shape; cannot become chipped or torn; is not affected by hot or cold temperatures, or by oil or grease. Divine Canvas Cushion Wheels are the most durable, economical and dependable protective tread truck wheels ever manufactured.

Moreover, these Canvas Cushion Wheels are practically noiseless in operation. They are widely used in all classes of institutions where maximum silence is essential.

There are Divine Canvas Cushion Wheels and Casters made for every type of truck wheel service; for store, library, office, hotel, hospital, factory, warehouse or terminal trucks; for hand trucks, platform trucks, trailers or lift trucks; for portable equipment and for many other special purposes.

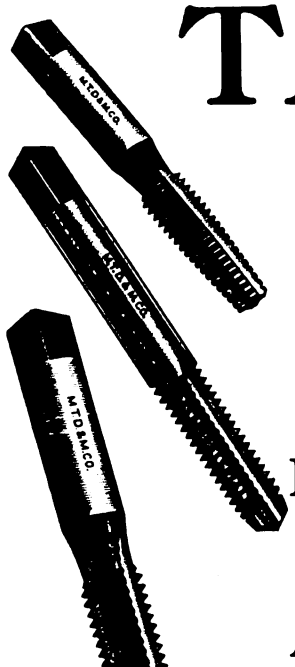
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INCORPORATED
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Accurate Lead

Free Cutting Qualities and Great Production of Threads per Dollar of Cost

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Morse High Speed and Carbon Speed Drills, Cutters, Reamers, Countersinks, Taps and Dies. Also Arbors, Mandrels, Chucks, Sockets, Sleeve Taper Pins; sold by reliable dealers everywhere

all over its surface, and the lighter metal had worn down 0.003 in., tapering to 0.005 at the corners.

Other tests included a drop test to parallel that of dropping by workmen and falling off work tables. Here each piece tested was pushed off a table 37-in. high and landed upon concrete, with other tests made upon a steel plate for a landing block. As a test of corner battering each block was dropped cornerwise into a tube 37-in. high. The drop tests were repeated 100 times and then the pieces micrometered to show how great were the bruises raised above the flat planes. An average bruise of 0.008 in. was found on the iron blocks and 0.017 on the composition blocks, with the greatest difference 0.023-in.

Subjected to the scleroscope test, the rebound of the iron was read up to 40 hard while the composition reached a maximum of 35. This latter figure shows, incidentally, that it is possible to run aluminum compositions up very high, for ordinary aluminum of commercial grades will show a scleroscope reading of only 3 and when alloyed with manganese has not been expected to run much above 15.

The great value of different tests may be noted in connection with the last one detailed. Getting a 40 reading versus a 35 might have been taken as conclusive of near-equality in hardness or penetration or compressive strength but this plant carried out one more and got rather contradictory results. Placing these pieces under a 100-ton hydraulic press, dial readings were made at the point of collapse and where the aluminum composition failed at 5 tons the other block stood up until 20 tons was reached.

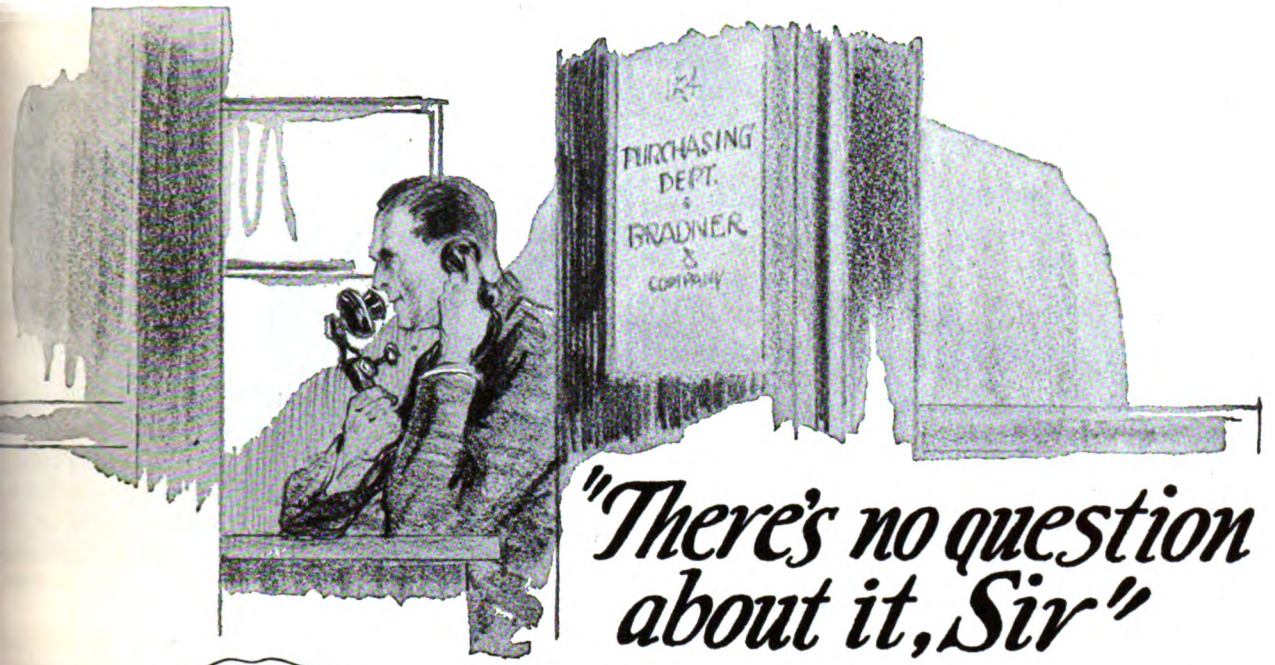
From the foregoing, it can be seen that tests which are of inestimable value to industry can be carried out without running into unreasonable expense. In this case the nature of the product was simple but merely because of this those concerned did not resort to snap judgment and did not stop at a single test. By thus being thorough they not only acquired a most authoritative comparison of two metals but they learned more about them than they had known before and were enabled, incidentally, to make some changes in design that saved foundry expense.

To be truly accurate, such tests of two products must be made under as near like conditions as possible. For instance, the two blocks shown in Fig. 1 were measured by the same micrometers, at the same temperatures and by the same man. The immersion tests, likewise, were made by suspending blocks in an alkaline solution, side by side and over the same period of time. Not only do engineering forces acquire data from such tests but sales departments can get important arguments with which to meet their trade. Summarized in black and white, as in Fig. 3, there is proffered a story that a customer with no technical knowledge at all can comprehend at a glance.

Machine Reclaims Tons of Cement

THE cement that is left in bags when they are emptied is a big item where great quantities of the product are used. In order to clean the bags thoroughly there has been devised a special machine that does the work in such a thorough manner that it maintains an average of reclaiming a pound

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"There's no question about it, Sir"

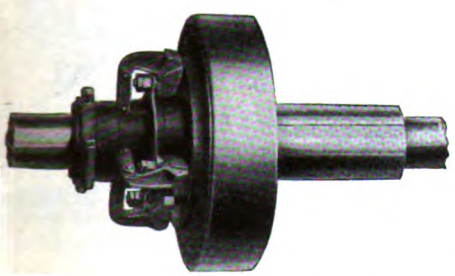
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"As you know, Mr. Bradner, our old Wood's Equipment has stood up well all these years. There's no question in my mind about the advisability of using Wood's in the new plant.

"In fact, I would figure Wood's equipment an exceptionally good buy considering the many years it lasts and the savings in maintenance costs over other equipment."

And so the Company President got an inside slant on Wood's Power Transmission equipment from his Purchasing Agent—a man who knows values and prices.

WOOD'S POWER TRANSMISSION MACHINERY



A typical example of the esteem Wood's Equipment enjoys among many manufacturers throughout industry.

Our catalogue tells you how completely we can serve you. Send for it.

T. B. WOOD'S SONS CO.
CHAMBERSBURG, PA.

Wood's Power Transmission Machinery

Shafting
Pulleys
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Pillow Blocks
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Rope Drives
Speed Reducers
Ball Bearings



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The New No. 11

—a Brown & Sharpe Micrometer

with several exclusive features



Micrometer Caliper No. 11 $6.25

With Ratchet Stop $6.75

You, whose business is buying a maximum value with every dollar, will appreciate the exclusive features of Micrometer No. 11.

There is a new type of adjustment on the barrel that enables you to lock it positively in position after adjusting. Shape of frame at anvil end permits measuring around projections, splined shafts or slotted and odd shaped pieces. Narrow frame makes it possible to use No. 11 in places where usual style of micrometer will not enter.

Another feature of Micrometer No. 11 is its adjustment for wear. Adjustment is the simplest yet devised. It is made on thimble and can be locked after setting—an exclusive Brown & Sharpe feature.

Ask your dealer about Micrometer Caliper No. 11 or send for circular. For other Brown & Sharpe tools, send for Catalog No. 30.

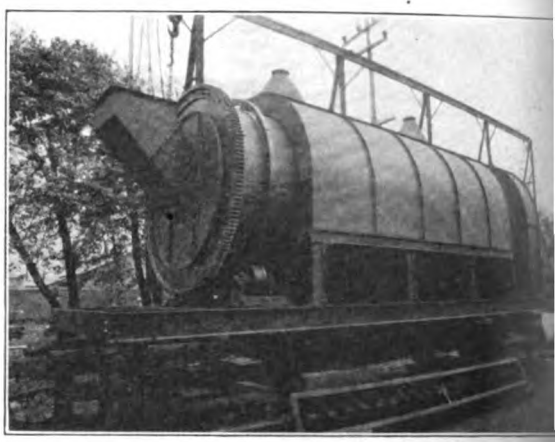
Dept. I.I.
BROWN & SHARPE MFG. CO.
Providence, R. I., U. S. A.

BROWN & SHARPE TOOLS

"World's Standard of Accuracy"

cement from each of the 5,000 bags sent through it a day.

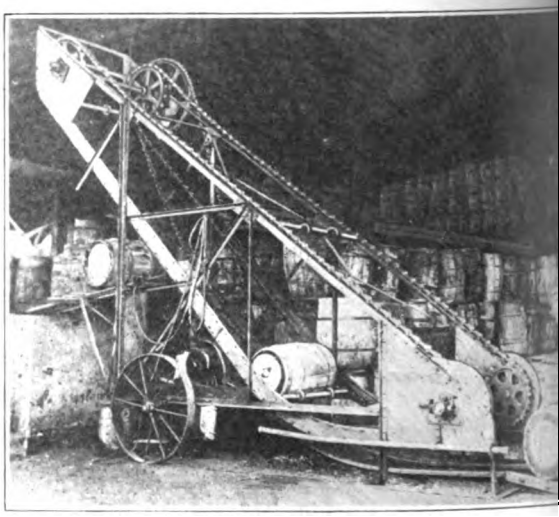
This cleaner is a combination of a revolving scr with lifters, within an air-tight chamber, connected



dust collector. The bags to be cleaned are fed into revolving hopper by means of a belt conveyor. T pass through the revolving drums and are dischar through a hopper at the rear. The reclaimed cem is deposited in a bin running the full length of screen, and is conveyed back into the system.

Portable Barrel Elevator

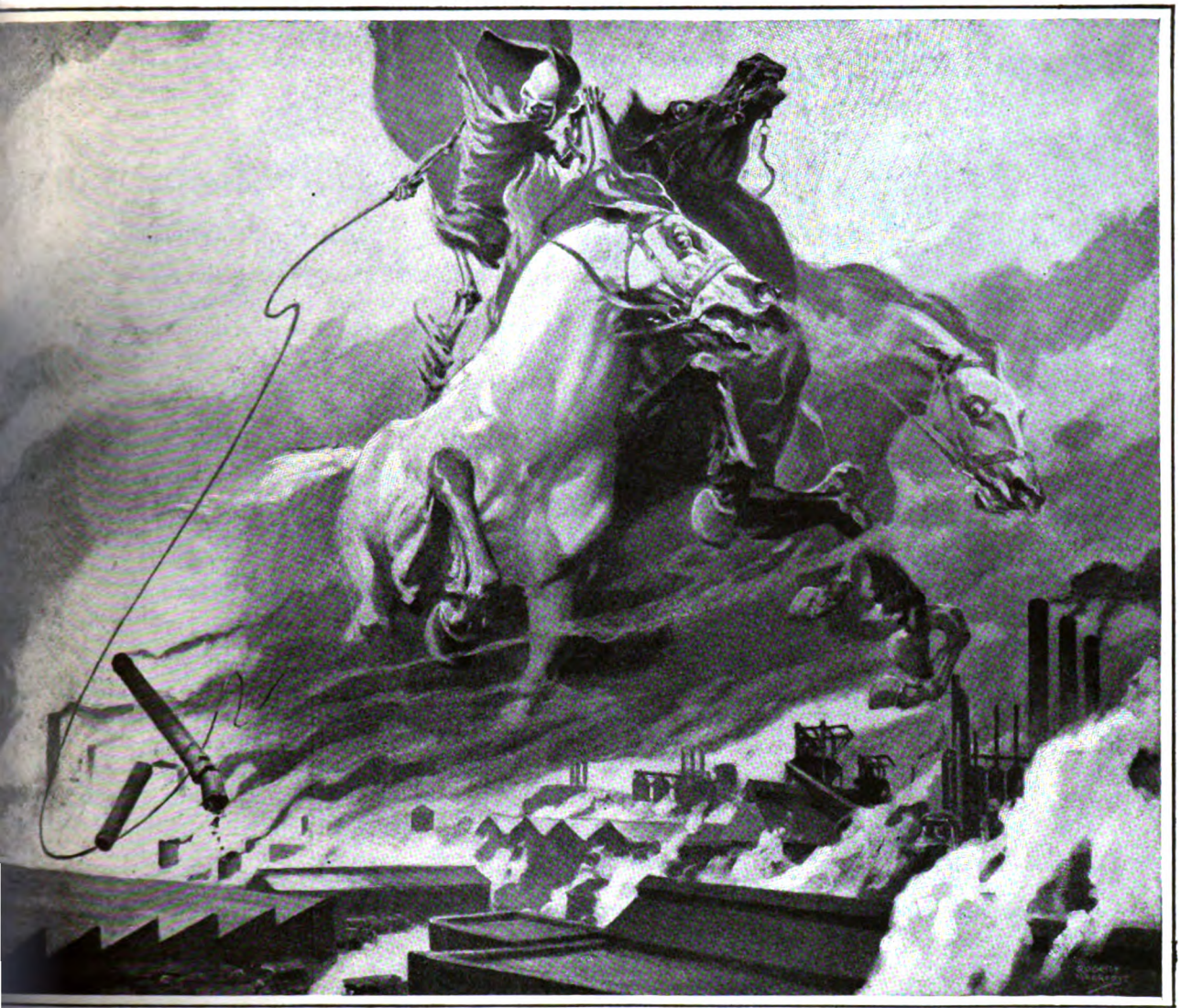
THE plant of the Barrett Mfg. Co. at Chrome, N uses a modification of a well known form of chanical elevator for moving 500 lb. barrels of tar in warehouse, and for loading boxcars.



The usual form of barrel elevator consists of a s tural frame, two strands of chain, suitably shaped ing arms to receive the barrels, and a worm gear act transmission connected to an electric motor.

In the portable machine, the structural frame is as light as permissible and is mounted on a wheeled A skid is placed at the loading point and at the dis point. The two strands of roller chain are connec intervals by pusher arms having rollers mounted shaft. Barrels are placed in the path of the lower s of chain and the push bars roll the barrels up t clined skids located between the two lower stra chain. These skids are bent out, away from th veyor frame at the level of the car floor, and the

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. . . when Waste rides your horsepower

HARD and high he rides, this reckless raider. It's Waste—the scourge of Industry.

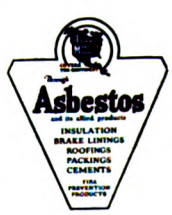
Devil-may-care methods of driving horsepower through the power plants of America, are responsible for staggering fuel losses—millions of tons of coal annually.

Almost every individual plant in the country carries some share of this loss on its books today.

Preventing such losses for shrewd industrialists has become an industry in itself—the business of Johns-Manville.

Through Asbestos — packings, insulations, refractories, etc. — Johns-Manville is making new standards of plant efficiency possible and keeping horsepower from the treacherous reach of Waste.





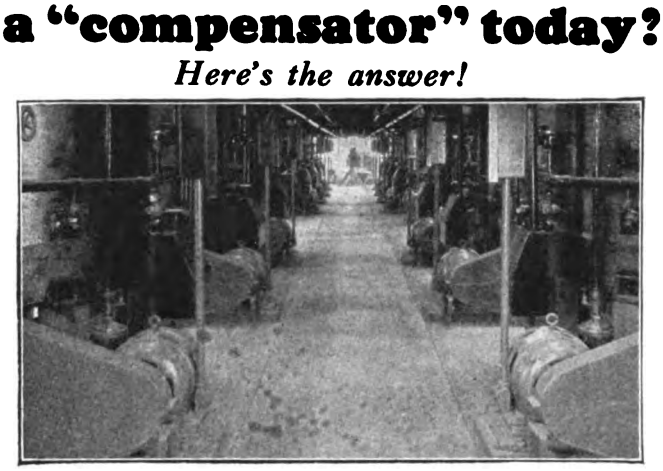
JOHNS-MANVILLE
SAVES HORSEPOWER

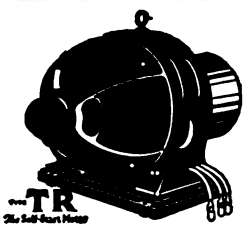
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Should any motor have a "compensator" today?

Here's the answer!





The TR Super-Motor—*no compensator in any size*—applied on *running, not* starting load. Cuts first cost and current costs. Lowest cost push-button control. Write for bulletin.

Here are 44 TR Super-Motors driving rendering tanks in the Indianapolis Garbage Disposal Plant. Motors are thrown across the line by automatic switch (no compensator) and they bring the agitators up to speed in about 3 minutes. Other makes of 15 hp self-start and squirrel cage motors proved incapable of starting the load. Unless 15 hp TR's were used, 20 hp motors were required.

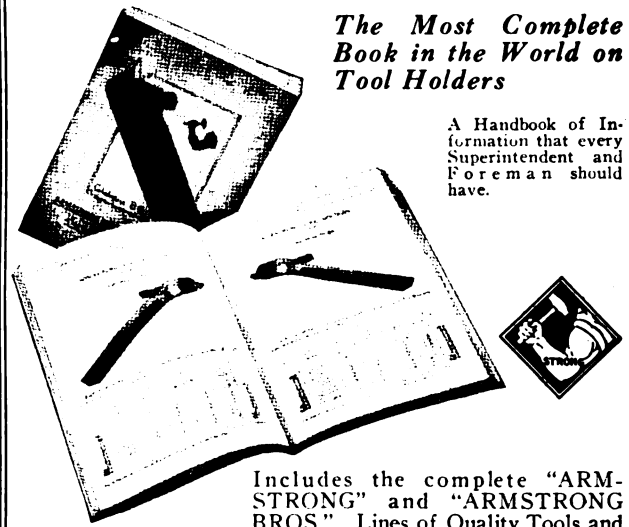
Just another example of how and why the modern TR Super-Motor saves money. No compensator, and a 25% to 60% smaller motor! When the application engineer says "compensator control" that's the time to change to TR Super-Motors and a push-button!

Get the facts about the TR Super-Motor and learn how to cut your power-costs. Send for Coupon!

THE TRIUMPH ELECTRIC CORPORATION

Builders of squirrel cage, slip ring and TR Super-Motors since 1892

157 East 70th Street **Cincinnati, Ohio**



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A Handbook of Information that every Superintendent and Foreman should have.

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"The Tool Holder People"

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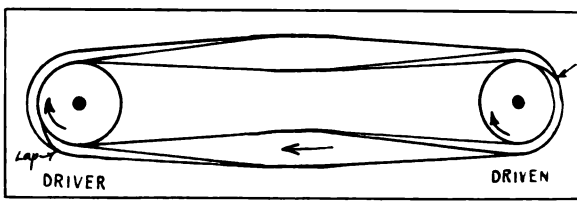
CHICAGO, U. S. A.

on reaching the bend, roll by gravity into the car, or o a platform in the warehouse. The machine may be op ated by one man and will easily handle two 500 lb. b rels per minute, with a 3 hp. electric motor for pow

A Belt Lap Kink

By W. F. Schaphorst

THE old rule regarding the correct way to run belt laps does not take into consideration the that on one pulley the belt slips or creeps in one di tion and on the other pulley the slip or creep is in opposite direction. Slipping and creeping are alw toward the tight side of the belt.



Therefore while on the first pulley the slip ma such as to "smooth" the scarfed edge of the joint, slip on the second pulley would have a tendency to the joint and cause the feather edge of the lap to ro

The sketch herewith shows how, by simply giving end of the belt a half turn, the tendency will b "smooth" the joint on both pulleys—which is should be.

For wide belts on pulleys that are close togethe method is not recommended, but for narrow belts it right. Also it will give good results on wide belt with pulleys far apart.

Another advantage of a belt turned in this manr that each pulley has its own side of the belt to work that the flesh side will always be in contact wit of the pulleys and the hair side with the other p Projecting belt fibres therefore are not first ben rubbed in one direction and then in the other dire an action that may cause rapid wear. The fibres o sides of a single belt will lie always in the same dir as the lap—a condition that is ideal. This adv holds whether the belt is single, double, or triple whether leather or fabric.

Automatic Heat for an Automa Station

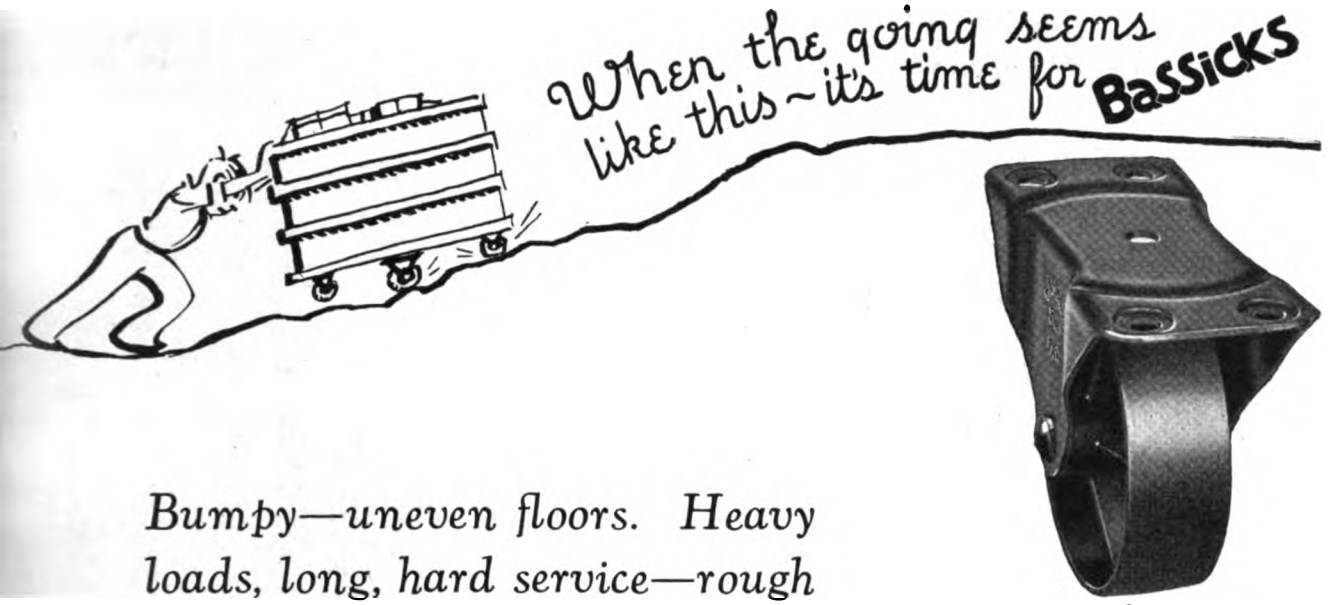
FREEZING of the pumps in the automatic pu station of the town of Morristown, N. J., vented by the use of electric heat. The need o control and the necessity for unattended op eliminated the possibility of using fuel.

The pumping station, a brick building about 29 feet in size, is located at some distance fr town and is exposed to the elements on all sid order to prevent the pumps from freezing i weather, a total of 30 kilowatts of electric heatin was installed, General Electric oven heaters bein Six of these units are now in operation, connect in series, 3-phase, Y, on 440 volts.

The heaters, protected by a screen, are a

ot advertised in this issue write Industry Illustrated

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Bumpy—uneven floors. Heavy loads, long, hard service—rough ***handling—careless handling is pretty tough on casters—and floors, too, to say nothing of plant efficiency.***

How easily it rolls on Bassicks

Bassick has met that situation

MET it with a line of casters that are built for hard use—built sturdy from the finest materials and under engineering supervision—reinforced at wherever reinforcement will prolong life and service.

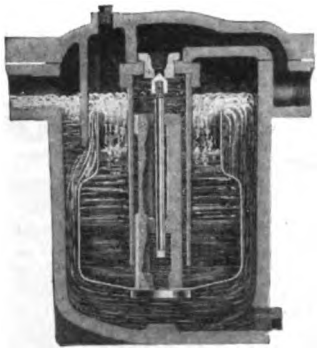
Consequently, Bassicks roll easily and turn easily. roll smoothly—quietly—and safely under all plant conditions.

You can depend upon Bassicks—always. And remember, there is a Bassick for every separate caster need in your plant. Send today for Catalog F-104.

Bassick Casters
Reg. U. S. Pat. Off.
The BASSICK COMPANY
(*A Division of Stewart Warner*)
BRIDGEPORT, CONN.

For thirty-one years the leading makers of Better Casters for home, office, hotel, hospital, warehouse and factory.

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ILLINOIS Eclipse Steam Trap

No Other Trap Has This Feature

The valve action is SNAP action. Valve is either tight closed or wide open. Never cracked on seat. Wire drawing impossible.

Other Features: Can't blow steam or air-bind.

No complicated levers—only TWO moving parts.

Shipped Prepaid on 60 Day FREE Trial

The Eclipse is not "just another steam trap." Its valve action makes it the OUTSTANDING Steam Trap of the Day! Test one on your "worst service."

Under ordinary conditions most any trap will operate reasonably well for a while, but—it is the severe condition—the *worst service*—that shows how an Eclipse will end your trap troubles.

This coupon brings prepaid an Eclipse Improved Steam Trap for 60 day free trial.

MAIL IT TODAY

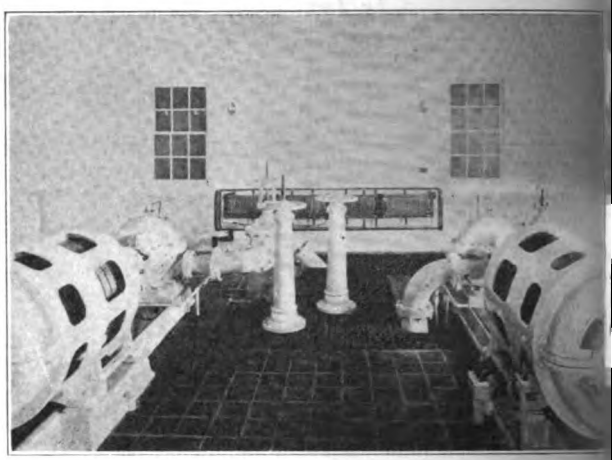
ILLINOIS ENGINEERING COMPANY
21ST AND RACINE AVE., CHICAGO

Please ship prepaid an ILLINOIS Eclipse Trap for 60 day free trial. It is understood that this is to be of *no* expense to me and that after testing the trap I may return it WITHOUT QUESTION.

Size of pipe connections .....Trap capacity.....
Maximum steam pressure .....
Firm .....
Address .....
.....
Signed .....Position .....
☐Send trap bulletin only.

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD ... INCORPORATED 1900

along the north and east walls near which the pumps and other equipment are located. They are controlled with a standard automatic panel and Bristol temperature control instrument of the type ordinarily used with industrial ovens.



In order to secure the benefit of the minimum ra for power, it is necessary to cut out the heaters f several hours in the early part of the evening. Wi this in mind, the present installation was designed maintain a temperature of 50 degrees during the da as it was estimated that, during the period the heate are cut out, the temperature in the station would fa about 10 degrees. The minimum outside temperatu was estimated at 10 degrees below zero.

Graphics in Perspectiv

By I. J. Beatty

IN a plant having buildings of various heights, tered over an area equal to more than an ord city block, some graphic method that will show single chart of convenient dimensions the location fire protection equipment, motor drives, manufact and contributory departments, etc., will be foun great assistance to the busy executive, as it will ena him to visualize the progress of many things requiri his attention. As a Chinese proverb, quoted in INDUS ILLUSTRATED, has it, "One picture is worth ten t sand words."

While looking through a file of articles publish previous issues of *Industrial Management*, a tribution, "Perspective Routing," by Paul K. G was found in the October 1924 number which furn the solution to such a presentation: The probl lustrated in that article was more simple, as it prised only the several floors of a single building if the floors of a building could be shown in perspe why not a plan of the property, showing all the bu ings and the various floors in each?

The idea proved to be practical, and a large dra was made in a somewhat distorted perspective, emphasis being on the practical use to be made of drawing rather than meeting the canons of ar drafting. From the large drawing prints were m These proved so useful that a request followed smaller sketch to provide prints of a size more c handled. Next came the idea to prepare a mimeogr

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Connect with Machines and the Man Behind

You can connect Veeder Counters with more machines, more applications than this page could list. But they'd all come down to *this:*

Counters connect with human nature—the human trait to *do more work* when the work is recorded and the record watched.

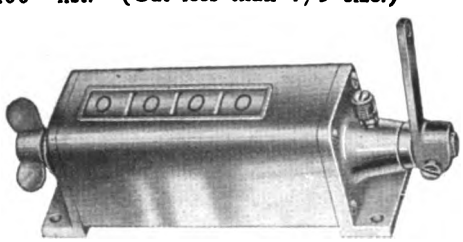
As sure as man controls the machine, you get more attentive, *productive* man-power with a

Veeder

Here's the special Veeder Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable.



Built especially for recording the product of heavy-duty machinery where a reciprocating movement registers an operation. Strong stops limit the movement of the lever to 45 degrees or ⅛ turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price $18.00—list. (Cut less than 1/3 size.)



The above *Set-back Rotary Ratchet Counter* counts one for each oscillation of the lever, as required in counting the product of presses and metal-stamping machinery. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as needed. Price, with four figures as illustrated, $11.50. (subject to discount). Equipped with lock and keys to prevent tampering with the record, $2 extra. (Cut ½ size). Set-back *Revolution* Counter of similar model, price $10 (list). Smaller counters from $2.00 up.

Write for the Veeder complete-line booklet

The Veeder Mfg. Co.

31 Sargeant Street Hartford, Conn.

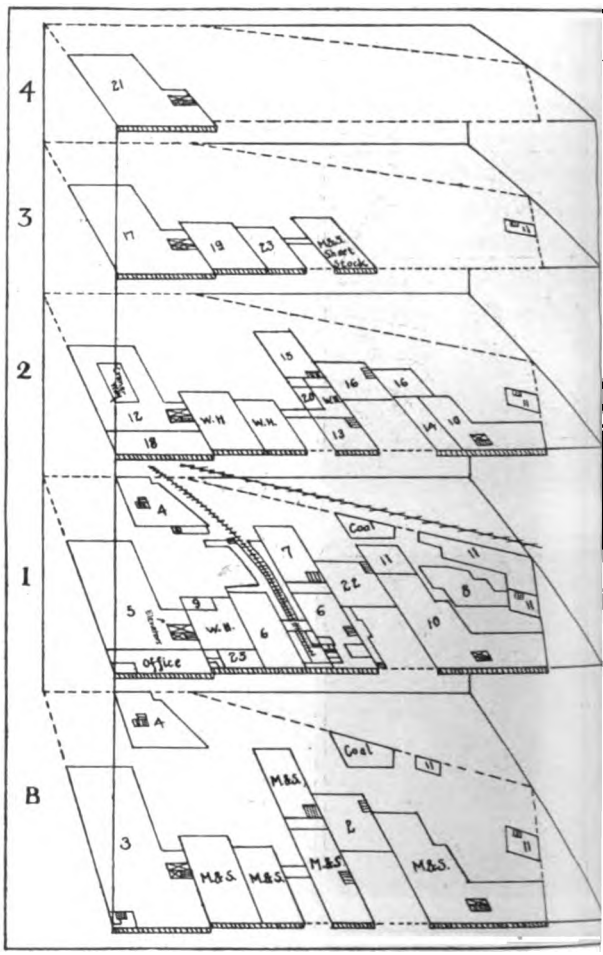
Middle West Distributor
F. A. Bringolf
549 Washington Blvd.
Chicago, Ill.

Pacific Coast Distributor
F. Sommers Peterson Co.
57 California St.
San Francisco, Cal.

stencil from the smaller drawing, which was accordingly done, and a supply of the charts printed.

A glance at the sketch will show that one of the buildings has four stories and basement, none of the others having more than three. The tracks shown on the second plan from the bottom serve to identify the main floor readily, and also to show the relation of the tracks to the buildings.

The numbers and lettering refer to the departments (1) Office; (2) Pipe Cutting and Bar Stock Storage (3) Machining; (4) Enameling; (5) Erecting; (6 Receiving and Shipping; (7) Tinning and Galvanizing (8) Power Plant; (9) Millwright; (10) Wood Shop



(11) Brass Foundry; (12) Lathes; (13) Wood Patte (14) Sub-Assembly; (15) Electroplating; (16) S Assembly; (17) Painting; (18) Tool Making; (Sub-Assembly; (21) Tin Shop; (22) Box Facto (23) Sub-Assemby; (25) Development; M. & Stores.

The outside dimensions of the small drawing 7 by 11-in. and the charts are printed on 8½ by 1 stock. When desired for reference, they can be trim to fit a binder 11 by 8½ in. One use made of print was the charting of motor drives. Group d are used for the distribution of power, and on the was noted the location, horsepower and serial nu of each motor.

The routing or movement of work in process be shown graphically by the use of dotted or col lines; and when it is desired to follow a special or order through the shop, the schedule and the move of the order through the departments can be show

ts *not advertised in this issue write Industry Illustrated*

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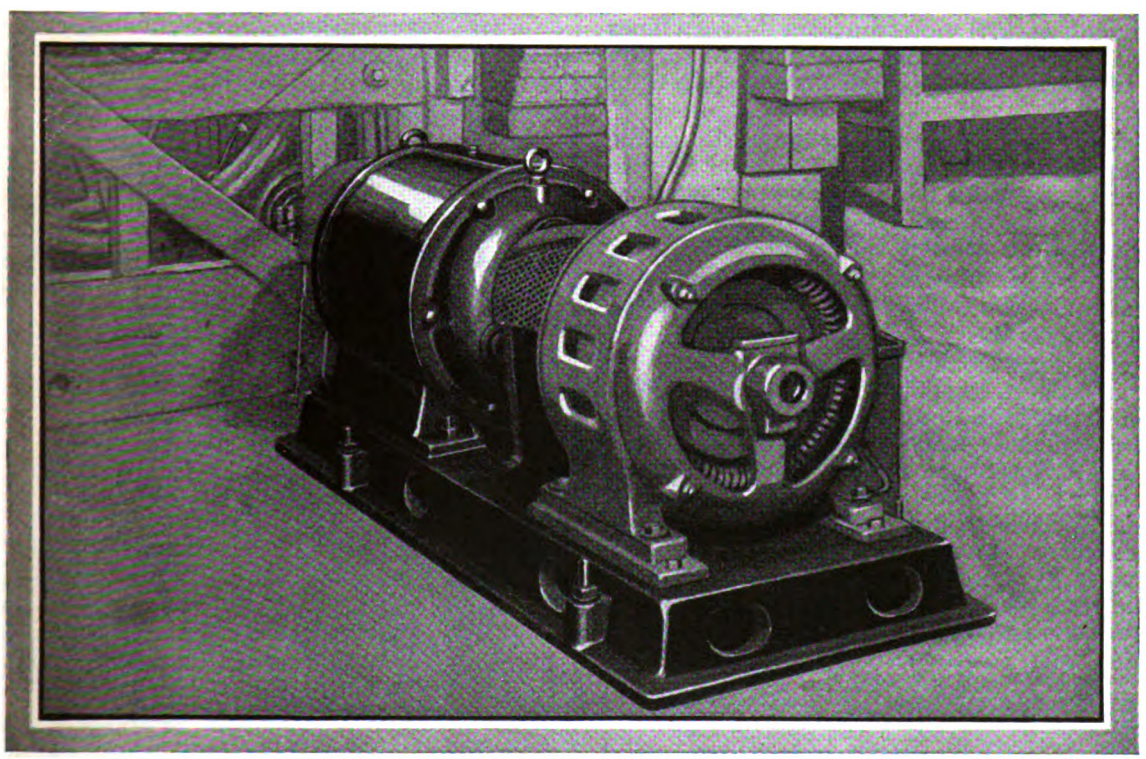
A *Speed Reduction Unit* of many advantages

Economy in speed reduction drives starts with the decision to install Jones Spur Gear Speed Reducers.

As you can see, installation is simple and costs very little. Space is saved and danger of personal injury is avoided. The drive is a balanced, straight-line drive. The gears inside the dust-proof housing operate in a constant oil bath. Perfect lubrication is maintained. The only attention required is occasional replenishment of the oil supply.

The illustration below is from a photograph of a Jones Spur Gear Reducer driving a sugar crusher. Jones Reducers are operating constantly, many of them twenty-four hours a day, in every branch of industry where high speed motors are used to drive slower moving machines.

If you have a speed reduction problem, write us. Our engineering department will be glad to help you. Write, too, for Speed Reducer Catalogue Number 26.



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For industrial executives and superintendents alive to the fact that "moving is 90% of the making" an invaluable book on



"Material Handling"

Just off the Press

This new book is packed full of information on material handling work. It shows the many different types of material handling equipment best suited for the work to be done. No well-posted executive will want to be without it.

Is the system you are now using the best possible for the layout of your plant? You can *not* be sure until you have seen this book. Could you save minutes on this or that operation? This book will show you how others are doing it.

The concise form in which the data is presented makes its application to the conditions in your plant easy and practicable.

56 pages of dimensioned drawings! 72 pages illustrating the application of material handling equipment to almost every type of work—including yours. No more valuable book has ever been written on this important subject. And its greatest value comes in pointing out ways to conserve time, space and men—in short, ways to cut production costs.

Your letterhead will bring this book to you—it is yours for the asking. No cost or obligation of course.

"Material Handling"
a book you will want to keep—covers the following subjects:
Track, Monorail
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Track Hoists
Track Opener, for Door Trolleys: 2, 4 & 8 Wheels
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Arched Bar Connection
Button Connections
Chain Block
Electric
Ext. Hand-Chain Wheel
Track
Twin-Hook
Switches—All Types
Cranes:
Push and Pull Traveling
Inverted End Trucks
Truss Type
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Portable Monorail
Safe Load Tables for Beams

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(for Overhead Lifting and Carrying)

Hand this to your secretary to attach to your letterhead
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Please send copy of the new book on "Material Handling"
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dates on the print—say, schedule dates in red and actua progress in black. Many uses for such a chart wil occur to those having to do with planning or manage ment.

A Warning to Steel Buyers

THE National Association of Purchasing Agent warns its members against a fraud being perpe trated by certain foreign tool steel salesmen. The chie offenders seem to be concerns located on the Continen Last summer they sent direct representatives into Canad soliciting business among many manufacturers in th chief manufacturing centers of Canada. They gained a entrée through letters of introduction to some compan official.

The next step was to interest this executive to th extent of placing a small trial order from the sample carried by the salesman. These trial orders in all cas were for only a few pounds of the material, with th value not exceeding a few dollars.

A month or so afterwards, the customer would b startled by having several packing cases shipped dire from abroad, dumped at his plant, together with a bar draft and invoice attached, running into thousands dollars. At first sight, the obvious thing would be simply refuse the shipment, but when the company attorneys examined the foreign purchase orders, it w found that by an ingeniously clever vertical and hor zontal arrangement of quantities, sizes, etc., the cu tomer had been tricked into ordering many times wh he originally thought he was buying.

A number of Canadian corporations were taken in this manner. Indignation against these salesmen co pelled them to pack up and come across the border. Th have victimized a number of American firms in simil manner. At first, their operations were confined to man facturing districts around the Great Lakes. Recent r ports indicate that other territories are being favored wi their attentions.

So beware of any foreign salesman soliciting steel o ders for houses that you know nothing about.

THE results of many investigations made during t past six months will be reported by various me bers and committees at the 33rd Semi-Annual Meeti of the American Society of Heating and Ventilati Engineers at the Greenbrier Hotel, White Sulph Springs, W. Va., during the three days June 28 to Every session will be full of interest for the engine the contractor or the architect who is actively interest in heating and ventilating engineering as the progr fairly bristles with topics that are of concern to th men in their every day work. For instance the Code Rating Low Pressure Heating Boilers will be repor on by a committee headed by Alfred Kellogg, Bost the Code for Heating and Ventilation of Garages will presented by O. N. Walther, Philadelphia; the resu of investigations of Cast Iron Radiator Performances Various Kinds of Enclosures will be reported on Prof. A. P. Kratz and M. K. Fahnestock as a result investigations at the University of Illinois in rec months and others. These topics and many others will discussed at the three-day meeting during the sessi which will be held from 9:30 a. m. until 1:30 p. each day.

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You Pay Double for Non-Productive Labor

An oil-soaked belt gives away, a bearing burns out, or when friction has worn bearing and shaft beyond use,—then repairs must be made and men must stand idly by. And the pay-roll remains the same.

There is a way to stop these losses. Do away with bearings that require constant care and oil. Install in their place Arguto Oilless Bearings. Arguto gives you permanent lubrication, 300 per-cent greater belt life, and freedom from friction and repairs. There is no throwing of oil to damage the product. They operate efficiently without attention for many years.

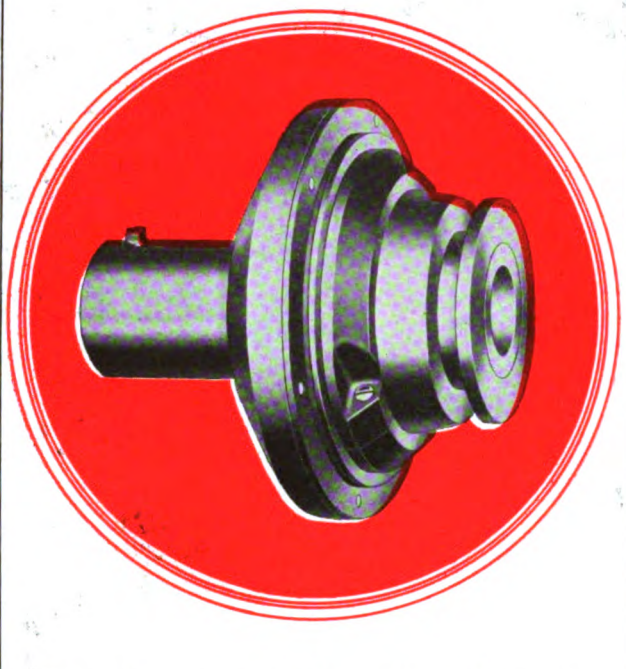
ARGUTO OILLESS BEARING COMPANY
Wayne Junction, **Philadelphia, Pa.**

Arguto Oilless Bearings



Let us send you further information and users' experiences with this remarkable bearing

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The Conway Disc Clutch is the last word in friction clutches:

Entirely enclosed,
Inherently balanced,
With under-slung levers,
Large lever ratio,
Accessible, accurate adjustment,
Drag free idling,
Helped instead of hindered by centrifugal force,
Steel Discs,
Chrome - nickel forged levers,
Full length bearing for loose member.

It's the first progressive departure in the design of Disc Clutches in many years. Investigate Conway Clutches.

THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio

Taking Time to Put the Product Through

By C. C. Hermann

IN the forge shop of a large manufacturing plant several men were moving a number of trucks; pushing them this way and that, to get a certain load of material which stood over against the wall. There were not less than a dozen truck loads between it and the main aisle. After a while the desired load was dug out only to discover that one of the truck wheels had been broken and the truck could not be moved. Another truck was found somewhere in the room and the load transferred. With the transfer of each piece there arose a veritable cloud of dust indicating that the load had stood there for some time.

An observer remarked to the department superintendent. "A considerable amount of labor connected with that batch of material."

"Yes," was the reply. "It seems that we just can't keep from working ahead on some pieces and fall behind on others. A chaser has spent a whole day locating that truck load of half finished material. The worst thing about it is that the load has stood here in my department under my very nose, for several weeks without my knowing anything about it. The fellows from the other department shoved it in here in bad condition."

Typical of the manufacturer attempting to carry on production without some means of scheduling. The same manufacturer was considering the addition of several thousand feet of floor space to his forge department. Just several thousand more feet wherein more trucks filled to over-flowing with half finished product to stray around in and get lost.

This same superintendent added, "Much of that could be saved by taking the time to put the material through in the production office."

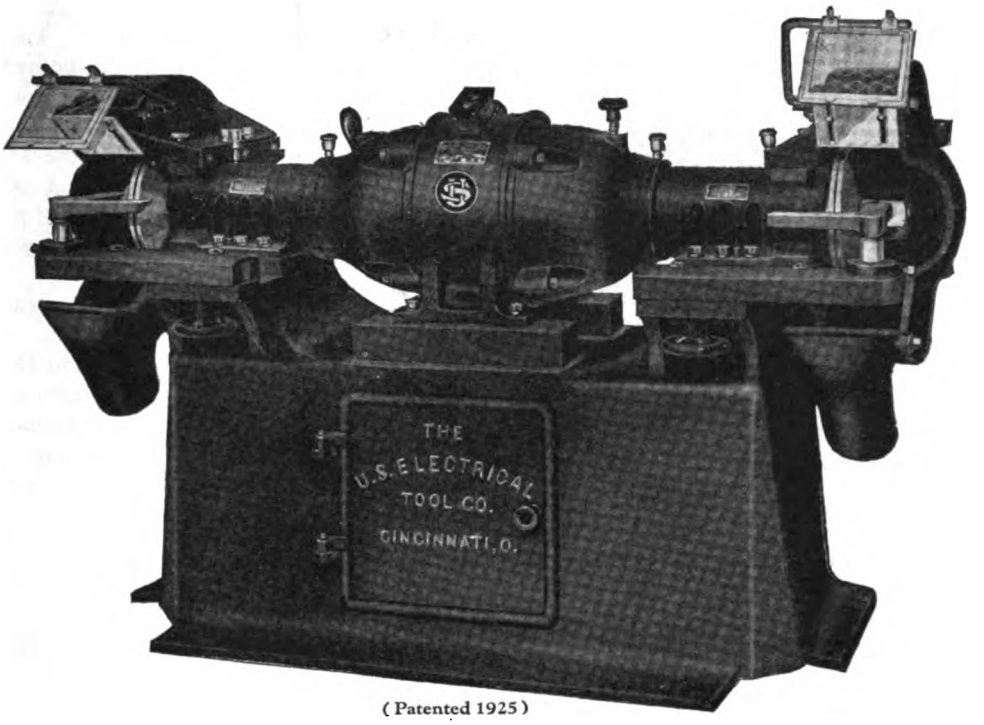
The usual procedure followed was for the production department to turn the order over to the department foreman who would divide the order up to suit his own fancy or conditions. He and his sub-foremen did all the planning with the exception of what was left up to the men at the machines. The men did most of their own planning. They left their machines in order to obtain the necessary tools. They walked perhaps half the length of the shop to bring up a truck load of material. They did this, that and the other thing, and as a consequence they were unable to devote the entire time to production and keeping the machines going the maximum number of hours of the day.

The foreman, his assistants and several men from the production office were kept constantly busy tracing material and partly finished pieces through the shop. They did not have the time to devote to the planning. They paid scant regard as to how the elements entered the next department. The chief object seemed to get it out of the department involved. Let the next fellow worry a little. This was planning production to suit the immediate local conditions, in a dozen little plants as separate from each other in objects as though they were miles and miles apart.

The forge [illegible] consulted by [illegible]

For products not advertised in this issue write

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(Patented 1925)

Heavy Duty
4 Ball Bearing
Adjustable Speed
Grinder
for A.C. or D.C.

Maintains Grinding Speed in Spite of Wheel Wear!

NO MATTER how worn the wheels become on this sturdy grinder, their grinding surface maintains a speed of approximately 5,500 feet per minute. This means production constantly at its peak. Less time out for wheel changes, too, and fewer grinding wheels per year because you can—

Use Wheels Down to the Flanges

These advantages are obtainable only in this U. S. Grinder because it is patented. Other desirable U. S. features include: Powerful, continuous A. C. or D. C. motor of .40 degree centigrade rating, and with 100% overload capacity. Four heavy duty SKF Ball Bearings in dust-tight enclosures. Exhaust connections on wheel guards. Positive shaft locking device for holding shaft while replacing wheels, etc., etc. Get all the facts before you buy. Ask your jobber, or write us.

THE UNITED STATES ELECTRICAL TOOL COMPANY

Builders of Electric Drills and Grinders in the World

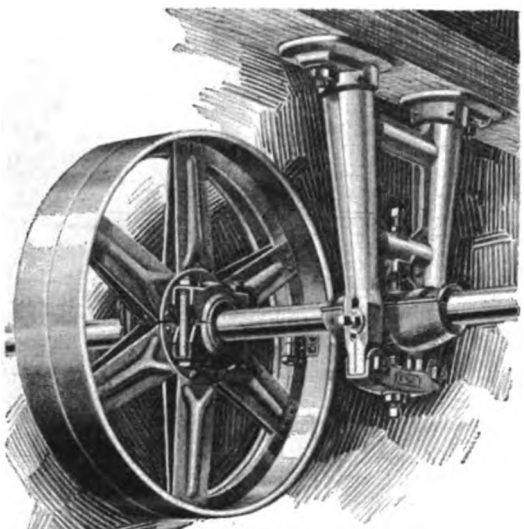
Street Cincinnati, Ohio, U.S.A.

[redacted]e Electric Drills
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"AMERICAN" Pulleys *and* Hangers

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The right to say this with all it infers was earned long ago for the name Stanley and the results are in countless tool chests the world over.

The same unswerving application to the task of making the best units for the transmission of power has placed millions of "American" Steel Split Pulleys in the workshops of an industrial world. There they are saving useful energy because their strength and light weight impose no unnecessary shafting load and because of transmission efficiency derived from true-running; firm grip on the belt; a center groove that permits escape of the air cushion and pulley arms that cut the air instead of fanning it. Added to these are other advantages from a design that also allows the installation of an "American" Pulley without stripping a busy shaft—the split or parting feature.

The strength, rigidity, light weight and general efficiency which have built up a paralleled popularity for "American" Pressed Steel Shaft Hangers, is the result of a like application of sound mechanical principles.

The advantages of both these "American" products are worth knowing. Concisely explained in special folders which will be sent promptly if you write for them.

Both "American" Pulleys and Hangers are used by The Stanley Works

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

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For nearest distributor see Mac Rae's Blue Book

AMERICAN PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS PATENTED

regarding the material which should enter first and b given preference. The steel was ordered in from th yard storage and the orders ground out. The truck load of material were passed on into the forge shop. Th latter department must take it as it came and if not ab to continue with the sequence of operations the depart ment foreman must pile it in the corner or along th wall. He was forced to see certain classes of machiner stand idle for hours waiting for certain pieces to com through.

Because of congestion alone the concern was losin thousands of dollars. The labor involved in digging ou some particular item from the maze of trucks and mate rials was a complete loss. It constituted overhead whic could be totally eliminated by the adoption of a plannin and scheduling system.

The basis of every scheduling system must be the mos economical method of putting a product through th plant. A study of machine production constitutes a clos index on the producing capacity of the establishmen Studies were made on the basis of from seventy-five t eighty-five per cent. possible capacity of the different ma chines and it was found that some of them were pro ducing as low as forty per cent. capacity. Up to this tim the management did not know and could hardly believ that it was costing them so much to get the produ through.

The fact that the foreman, his assistants and sever men from the production office were kept busy forcin things along and trying to locate lost parts seemed a ma ter of course. True, it was the old established metho of doing business. But when an order was held up fo days in the assembling department due to someone ove looking the production of a certain element; when a num ber of skilled workmen were forced to lay-off occasional until a certain element could be located, then these fo lows are called in "on the carpet."

The adoption of a scheduling system in the productio office involved the removal of individual department planning and the installation of coöperative plannin This, of course, increases the personnel of the produ tion department. A number of executives view the add tional men in the production department as involvi additional expense. They forget that for each man plac therein on planning relieves not less than five men the shop none of whom do it one-half so well. The sh help will be relieved for production work exclusive The congestion in the departments is relieved and it wor or should not, be necessary to move a dozen trucks order to get a certain truck load of material to the m chines.

Yet this is just what takes place in the plant after t adoption of a scheduling and planning system. L motion out in the departments where such can least afforded is eliminated. After a number of studies w made and every element entering the product schedul so that it had a direct route through the plant the sa as though it were on rails the addition to the forge sh was found unnecessary.

By centralizing this work of planning in connecti with tools and materials the workmen are relieved apply their entire effort toward meeting the demands the standardized job with respect to production ra Materials flow to the machines in a steady stream a away again. Not without human effort but with

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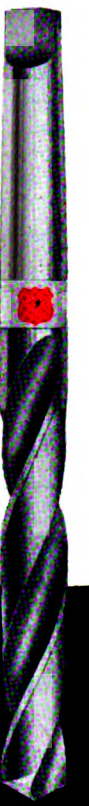
"Red Shield" HIGH SPEED DRILLS
ARE FOREMOST

Like a tower stands out distinctive and well remembered, the new "Red Shield" High Speed Drills, even with the short time they have been on the market, have won identical recognition.

Drill users who require high speed drilling with uniformity of performance, less breakage, and less grinding and at less cost per hole always remember that "Red Shield" Drills give such service.

The "Red Shield" in actual Red color, is stamped on each Drill. ALL SIZES

Manufactured by



STANDARD TOOL CO.

THE STANDARD TOOL CO.
New York Cleveland Chicago

Dr. Willson's Dust and Spray Mask

(Formerly Named Dustite Respirator No. 2)

For all dusty work and the various spraying operations done in the industries. Provides comfortable protection for the nose, mouth, throat and lungs.—Saves health, speeds up production.



Does not interfere with speech or vision. Fits anybody



Price $18.00 per dozen, f. o. b.

WILLSON GOGGLES, INC., READING, PA.

Manufacturers of safety goggles, welding helmets and handshields, and Dr. Willson's Dust and Spray Mask. Types for every industrial need.

Distributors in principal cities

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Your Fingers Are Safe



No, sir! The Parker Vise handle won't slip through and pinch fingers. Why? Because the exclusive feature of the spring and set screw (see cut) keeps the handle just where it is put. This means no lost time from avoidable accidents and satisfied workmen. It will pay you to use Parker Vises.

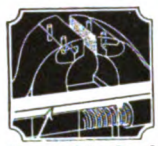
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PARKER VISES

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Renewable Steel Jaws


Swivel Base 360° Gripping Power

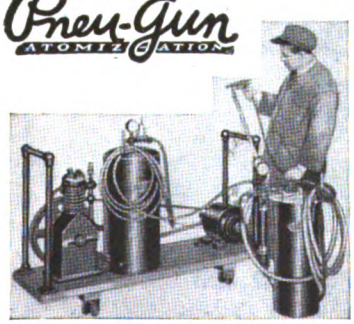

Handle Stays Put

GRIP LIKE A GRIZZLY

HAND-PAINTED BUILDINGS AND WALLS ARE EXPENSIVE

You Can Save 3/4 of Your Inside and Outside Painting Costs with the Paintair BRUSH MACHINE and Pneu-Gun ATOMIZATION

Revolutionary improvements in power painting have been effected by this equipment. It puts on the paint much faster and more evenly. No special paints or skill in mixing them required. Perfect mechanical balance insures years of trouble-free service. The Pneu-Gun sets a new standard for mechanical efficiency. Has from 8 to 20 parts less than other gun and is fully one-third shorter. Revolver-like balance. No exposed parts to be damaged. A light touch on sensitive one-finger trigger material control instantly changes width of paint stroke.



THE FOLLOWING FIGURES ARE BASED ON AN ANALYSIS OF OVER 60 JOBS

Hand brushing 456 Sq. Ft., 3 hr. 10 min. at $1 per hr.	$3.17
Air brushing 456 Sq. Ft., 20 min. at $1 per hr.	.34
Gross saving in labor costs by air brush	2.83
Cost of paint by hand brush	1.80
Cost of paint by spraying unit	2.00
Net saving effected by spraying unit	2.63

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MELLISH-HAYWARD CO.
Manufacturers
211 W. Austin Ave.
MEL-ROCK PRODUCTS
Established 1894
Chicago, Illinois

America's Headquarters for Spray Finishing Equipment

627
Please send me catalog 113, and give me details on saving 75% to 90% on painting costs by power painting with the Paintair Machine and Pneu-Gun.

Name .....

Address .....

friction. The workman is expected to do his work in the manner prescribed. The foreman and his assistant are no longer material chasers, without an objective. They can devote their time toward betterment of the system and working conditions in general.

The production department takes the requirements of the sales department and matches it with the plant capacity. They tear the order down and distribute it in accordance with the standard lot. The various departments send the order through according to the predetermined standard sequence. The department line-up knows when and in what quantity every element will reach their doors.

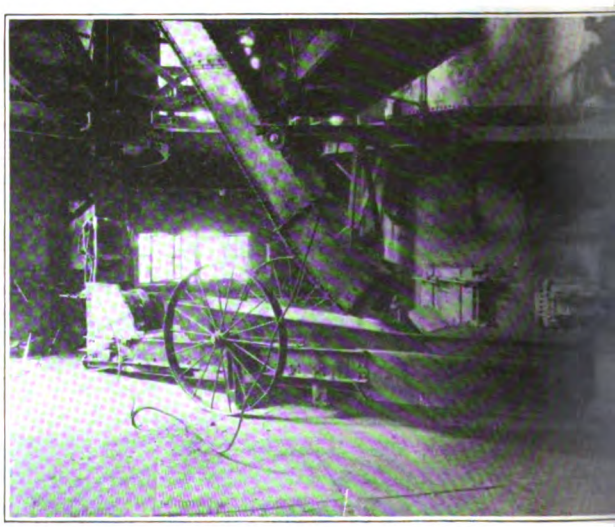
By this coördinated effort of the various departments and their executives the investment is kept working at its highest rate and production takes on a significant form. The founding, manufacturing and assembling departments are able to work coöperatively without friction. The product reaches the customer as per promise.

Saving Fuel in Gas Manufacture

By Edward J. Tournier

AT the Nassau Works of the Brooklyn Union Gas Co., Brooklyn, N. Y., a modification of the well known high speed belt is increasing gas production 1 per cent. per generator, on 24 hour operation.

Formerly in charging coke into the gas generators of the water gas plant it was necessary to leave open the generator charging doors 4 to 6 minutes during the time some 4,000 lbs. of coke were delivered by hand from buggies. This caused a daily loss of 3 hours and in addition did not distribute the fuel properly for economical combustion.



The coke is now discharged from overhead storage a chute on to a horizontal belt conveyor which can pushed into the charging door and manipulated so th even distribution is obtained.

The conveyor consists of a structural steel frame wheels, a belt and a chain connected motor drive 5 horsepower. The belt travels at the rate of abo 1200 ft. per min. and at this velocity the fuel can be pr jected across the full area of the generator, a distan of about 15 to 20 ft.

This method of handling permits the full charge 4,000 lbs. to be distributed in 2 minutes. The use two such machines makes it possible for two generat to do the work of three.

F ertised in this issue write Industry Illustrated

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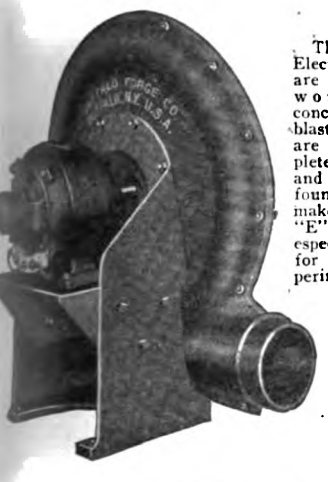
Production costs can be lowered this way—



The BUFFALO Slow Speed Exhauster shown here is guaranteed to save at least 20% in power over any other fan of equivalent capacity. Its heavy steel construction, large, well lubricated bearings and exceptionally slow speed make this fan efficient, quiet and exceptionally lasting. For exhausting chips, dust, filings, shavings, lint, etc.



For removing smoke, fumes, emery dust, etc., use the "B" Volume Exhauster shown here. Solid shell construction, large bearings and efficient design are responsible for the popularity of this fan. Also made for blowing forge fires, cupolas and many other purposes.



The type "E" Electric Blowers are used for any work requiring a concentrated steady blast of air. They are made in a complete line of sizes, and have features found in no other make of fan. Type "E" Blowers are especially suitable for unusual or experimental work.

In striving for lower production costs, do you take into consideration the economies that can be effected in the operation of "non-productive" equipment?

Have you checked up on the cost of operating blowers and exhausters in your plant, and do you know whether or not you're paying an exorbitant price for their service? Are you entirely familiar with what can be done with air in your plant, if it is properly harnessed?

Many large concerns find that undreamed of economies follow the overhauling of their exhaust systems. By installing efficient, reliable Buffalo blowers they move materials quickly and effectively at low cost.

Sometimes working conditions in certain departments are such that there is a high labor turnover. Buffalo Exhaust Fans installed there remedy this evil by removing foul air, smoke, fumes and dust.

Where forges are used, the installation of Buffalo equipment marks a decided improvement in working conditions and production, and usually saves valuable space.

In many unusual as well as common uses Buffalo Fans and Blowers are serving Industry—energizing air so that it becomes a helpful agent—keeping things "on the move," reducing the labor turnover by making working conditions more desirable—and in a dozen other ways contributing to the productive output of factories.

Our experience in adapting fans to the requirements of thousands of users is yours for the asking. Just a line stating your particular problem and we'll gladly make recommendations and quotations on the necessary equipment. If you are interested in our entire line of fans and blowers ask for catalog No. 860.

Other Products that reduce costs

Other Products we make include forges, drills, punches, shears and bar-cutters, both hand and power operated, complete heating and ventilating equipment including unit heaters, mechanical draft apparatus, spray nozzles, and other items.

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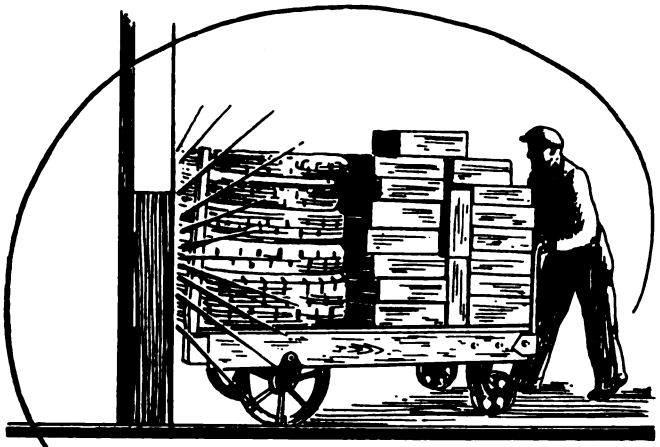
Buffalo Forge Company

470 BROADWAY, BUFFALO, N. Y.

In Canada: Canadian Blower & Forge Company, Ltd., Kitchener, Ontario

"Buffalo" fans for all services

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A Globe Truck
for the hard knocks

A factory truck certainly gets an awful lot of banging and knocking about.

That is why it is so important to choose one whose parts are so constructed and of such material that it will stand up under the most severe service and will handle the heaviest loads with dispatch and ease of operation.

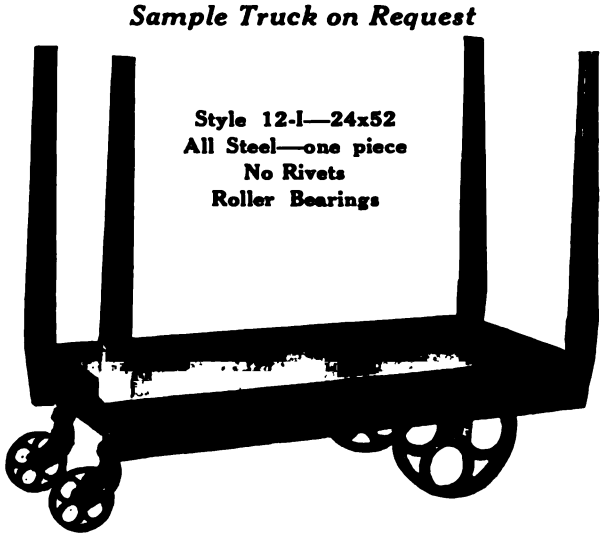
"Built Stronger to Last Longer"

Globe Trucks have the reputation of hauling heavier loads and giving longer service.

Globe Trucks are designed and constructed from an experience gained thru 25 years of truck building. 16 styles in wood and steel adaptable for all industries.

Get Globe facts, they will interest you.

Sample Truck on Request



GLOBE TRUC

GLOBE VISE & TRUCK CO.

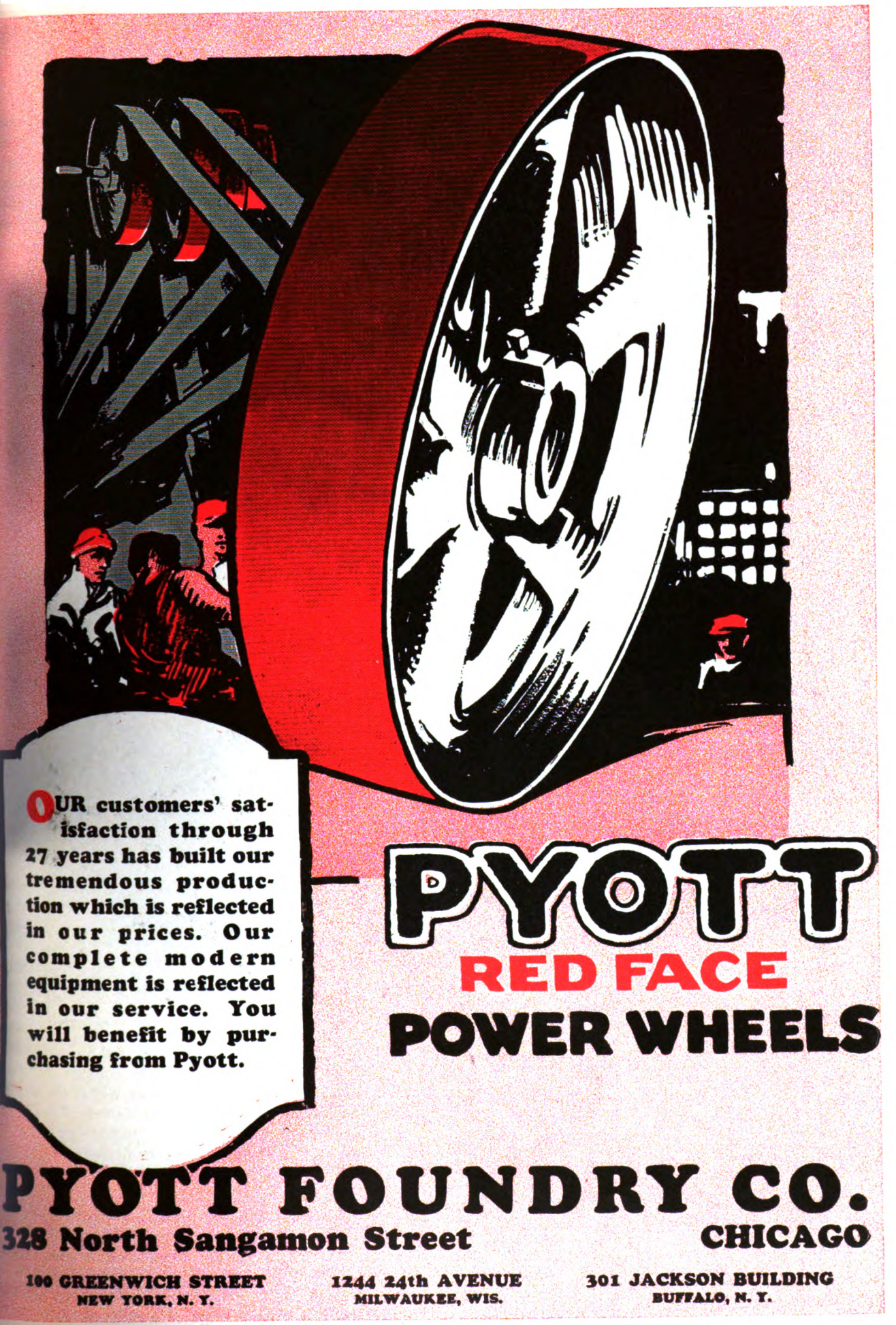
Substantial Slide for Heav Conveyor

A CERTAIN plant was experiencing difficulty a delays in keeping a slide or run in order f the returning portion of a heavy endless conveyor cha Slides made of wood, even when faced with metal strip frequently became damaged or worn. This troul was overcome by building the slide illustrated in t photograph produced.



This slide is made of two runs or lines of mec size railway track steel that was practically worn or unsafe for further use in track service. The reg rail couplings were discarded and the sections coupled with pieces of flat iron that was narrow enc to pass fully into the grooves in the sides of the Thus it was possible to place the two lines with the e of the bases of the rails touching, which the reg couplings would prevent by their lower edges exten slightly past the edge of the rail flanges. These lines are spiked with regular rail track spikes to cross sills supporting the conveyor studding. The tical links of the chain slide between the heads o two rail lines which keeps them straight and pre the chain getting twisted easily. The horizontal run with their flat side on the face of the rails. ors also slide along the face of the rails, and the at gs of the lags extend down beside the rails. is very durable and substantial, no trouble nced with it and it will last indefinitely for the forward or carrying side of the be similarly arranged in the conveyor prop

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PULLEYS THAT PULL

Complete Service Stocks Everywhere

For prompt deliveries we maintain a national distribution of stocks as listed below. Daily factory shipments keep these stocks complete.

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*In addition to COMPLETE range of sizes listed, also carry some larger sizes.

Send for Booklet giving detailed dimensions of the 2194 stock sizes, in 1½ to 14 inch diameters.

THE ROCKWOOD
MANUFACTURING COMPANY
INDIANAPOLIS, U.S.A.



A Roller from a Tractor

IN the work of laying asphalt surfaces and in the completion of clay and gravel surfaces the surface roller is indispensable. Yet in some localities considerable expense might be incurred in getting a factory made roller to the job. This may be distant from the source of obtaining the roller thus entailing heavy freight charges in shipping it to the job. Perhaps too the job isn't large enough to justify transporting the roller to it. A very effective and handy substitute for the usual surface compresser may be made from an ordinary tractor as shown in the illustration.

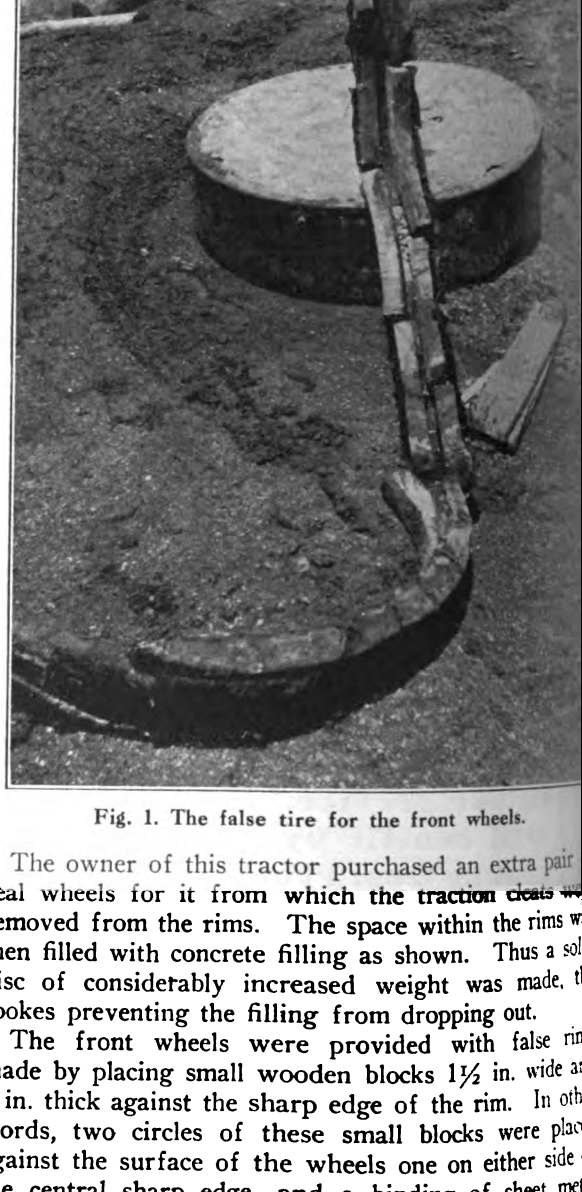


Fig. 1. The false tire for the front wheels.

The owner of this tractor purchased an extra pair of real wheels for it from which the traction cleats were removed from the rims. The space within the rims was then filled with concrete filling as shown. Thus a solid disc of considerably increased weight was made, the spokes preventing the filling from dropping out.

The front wheels were provided with false rims made by placing small wooden blocks 1½ in. wide and 2 in. thick against the sharp edge of the rim. In other words, two circles of these small blocks were placed against the surface of the wheels one on either side of the central sharp edge, and a binding of sheet metal was made by cutting slits two inches deep and four inches apart into each edge of a strip of sheet metal

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FAMOUS SEXTETTES

6-FAMOUS SCIENTISTS

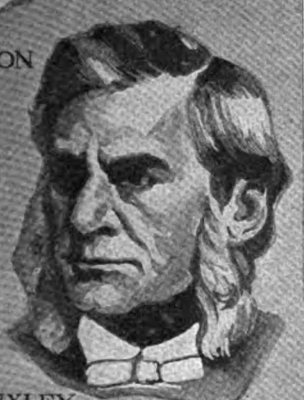

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6-FAMOUS TOOLS



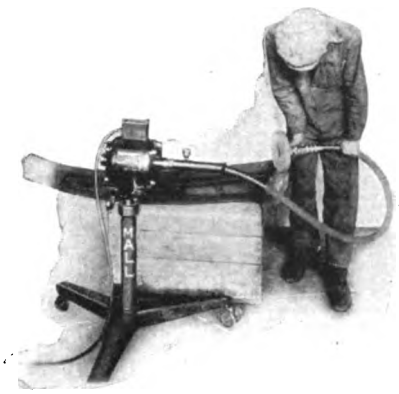
The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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Efficient Metal Finishing



Type D4—1 HP Mall Portable Grinder

Electric Flexible-shaft grinding machine using an 8" diameter x 1" wide rubber bond combination disc and edge grinding wheel operating at 3450 R.P.M. to finish steel castings.

MALL

Makers of the largest assortment of flexible shaft machines and attachments in the World. Shipments made on approval.

Write for illustrated catalog.

MALL TOOL COMPANY
7720 So. Chicago Avenue
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Screw "LENOX" Drivers



Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

Points are heat treated to stand the strain without bending. And the handles cannot loosen.

Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

AMERICAN SAW & MFG. CO.
Springfield, Mass.

"The Tools in the Plaid Box"

in. wide. The edges of the strips were turned down at right angles and encircled the wooden pieces much in the manner of a tire. The arrangement is shown in Fig. 1, which was taken just after the removal of the false rim from the wheel, the blocks remaining in place within the sheet metal cover.

When necessary to use the tractor as a surface roller the power wheels are dismounted and displaced by the two filled wheels as shown in Fig. 2, which shows the tractor converted into a roller, except that the rear wheel in the foreground was about to be removed and the retaining nut is not in place. By running the tractor back and forth over the road the weight of the machine combined with the increased weight of the filled rear wheels delivers considerable pressure to the surface. Then when a rolling job is done, the smooth rimmed wheels are replaced by the original wheels.

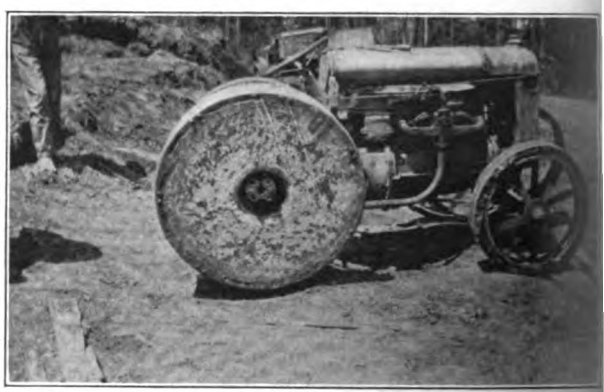


Fig. 2. The tractor is ready to roll.

Warning Signal Sounds When Lubricating System Fails

THE Power River Company of Vancouver, Canada has installed a combination of control devices and warning signals to prevent failure of the lubricating system for its electric generator, and to prevent overheating of the generator thrust bearing. On failure of the oil pump, a spare pump is immediately started and an industrial signal sounded, and a signal sounds when the thrust bearing overheats.

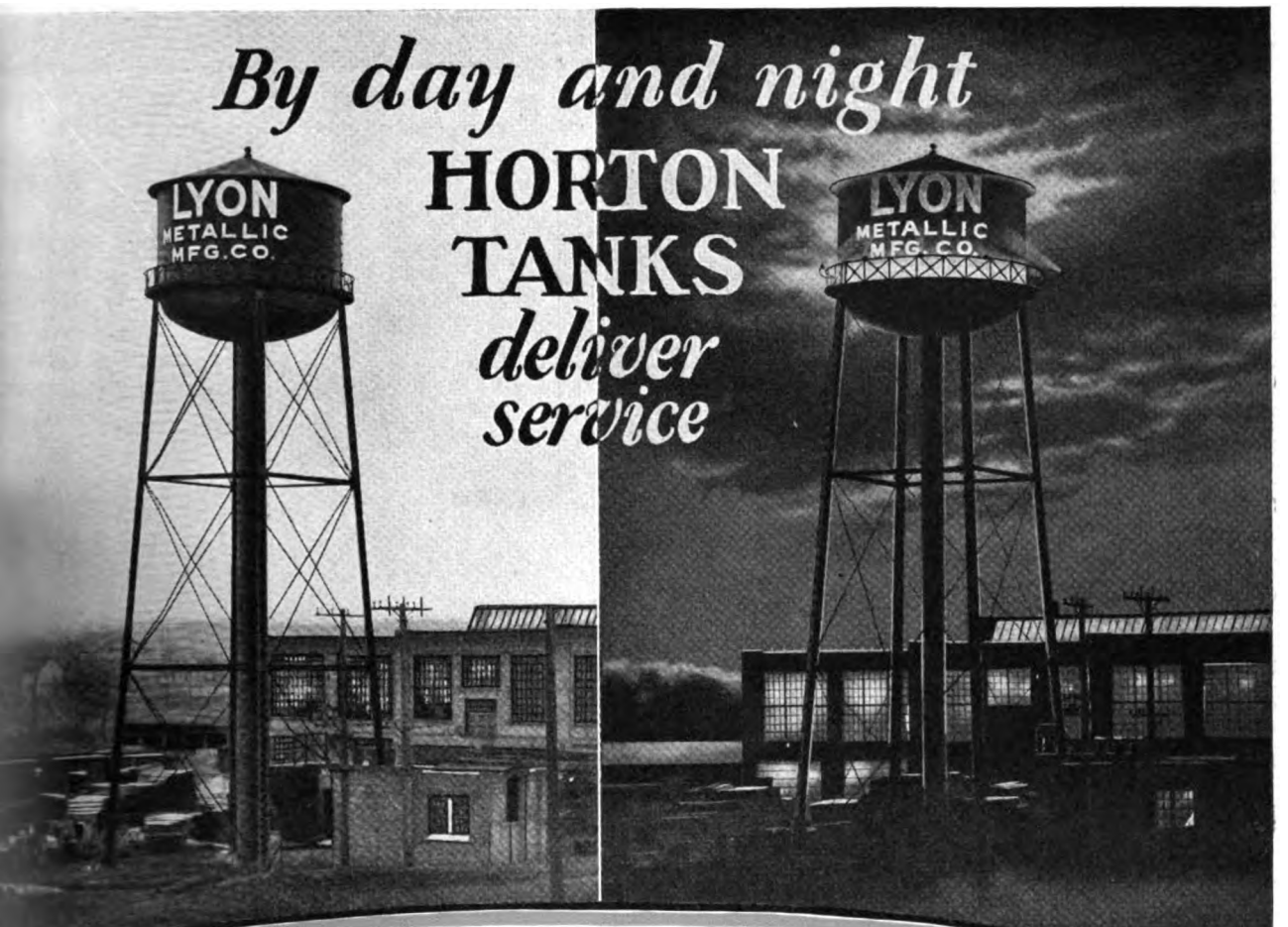
The oil pump which is regularly used during the operation of the generator is driven through gearing from the generator shaft. An independent motor-driven oil pump is also provided with an equipment for hand starting. Should the geared pump fail to operate, the motor-driven pump will go into service automatically.

A pressure switch is installed in the discharge side of the geared oil pump. With this arrangement, if the pressure of the geared pump drops, the pressure switch closes a magnetic switch and thus starts the motor-driven pump. The second pump operates until normal conditions are restored and pressure is again being delivered by the geared pump, whereupon the pressure switch opens its contacts and the motor-driven pump shuts down. On the closing of the pressure switch, an industrial signal sounds. The signal operates on 125 volts, direct current.

The thrust bearing on the generator is equipped with a thermometer alarm control which operates a 125-volt direct-current industrial signal. A special wiring scheme had to be arranged because the contacts of the thermometer control are suitable for handling a very low voltage only.

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By day and night HORTON TANKS *deliver service*

IF fire comes to this plant at any time—day or night—the sprinkler system is ready. The 50,000 gallons of water reserved for fire protection in the Horton Tank need only the force of gravity to bring it down. And gravity never fails. The same tank also stores 25,000 gallons for domestic service. This, too, is available at any time at uniform and ample pressure.

This tank, located at Aurora, Illinois, on the main line of the Burlington Railroad and two main trunk highways, also provides support for an attention-compelling sign, visible to hundreds of people by day and night.

Such a triple-duty tank will pay big dividends for years to come. Its long life and low maintenance cost insure minimum annual charges. Our nearest office will be glad to furnish estimates on a Horton Tank to meet your conditions.

CHICAGO BRIDGE & IRON WORKS

Chicago.....2465 Old Colony Bldg.
New York..3169 Hudson Terminal Bldg.
Cleveland .....2238 Union Trust Bldg.
Dallas...1658 Dallas National Bank Bldg.
Atlanta .....1023 Healey Bldg.
San Francisco.....1043 Rialto Bldg.

HORTON TANKS

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BRINGS THE TEMPERATURE TO YOU



The Actual Message of the Metal Bulb

The difficulties of obtaining frequent readings of temperatures at the operating points of refrigerating equipment are overcome most satisfactorily by the

MOTOCO

INDUSTRIAL THERMOMETER

A small metal bulb is placed where the temperature must be known. The message of temperature is brought to you through a capillary tube that is not affected by the surrounding atmosphere. The readings are taken at any convenient place where the dial may be located.

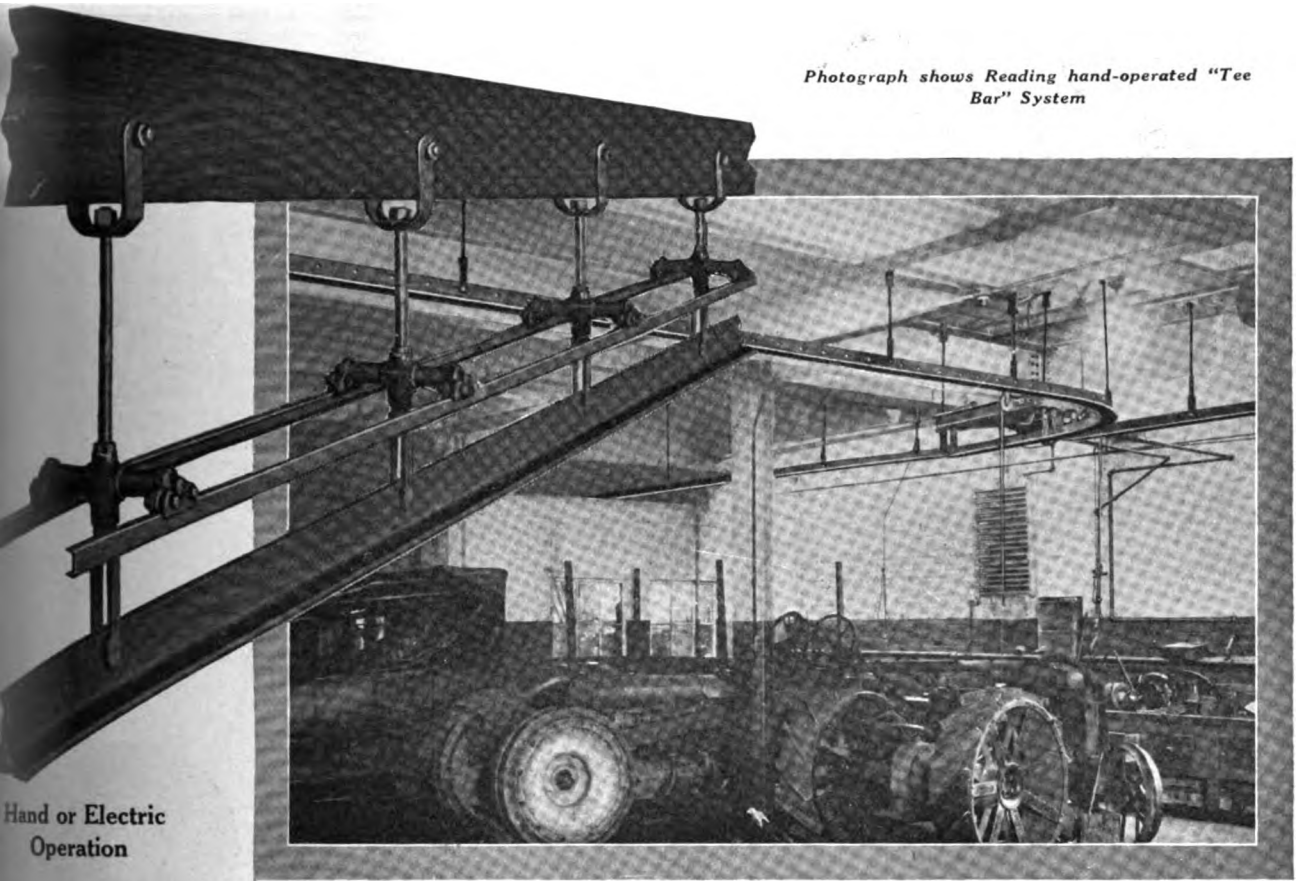
Since the temperature is brought to you under easy reading conditions, you will get it more accurately. Send for catalog No. 9 for full details.

The MotoMeter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.
Chicago Office, 820 Tower Court
National Gauge & Equipment Division, La Crosse, Wisc.
The MotoMeter Co. of Canada, Ltd., Hamilton, Ont.

The Industrial Division offers the services of the engineering staff to manufacturers requiring thermometer equipment. The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

Motoco Industrial Thermometers may be obtained in various ranges between Minus 40° F. and Plus 750° F.

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Photograph shows Reading hand-operated "Tee Bar" System

Hand or Electric Operation

Another Improvement in Overhead Handling

The READING "Tee Bar" System



An Everedy Electric Hoist on a Reading "Tee Bar" System

An inexpensive type of overhead carrying system that could be obtained completely equipped with the required switches, carriers and hoisting equipment for both hand and electric operation, has long been desired by plant managers.

Now, it is available in the Reading "Tee Bar" System. The old I-Beam Monorail has never been flexible enough and by far too expensive where a number of curves and switches became necessary. With the "Tee Bar" System curves are easily made on the job by a simple rail bender, which we loan to customers. The entire cost of installation has been greatly lessened both in labor and time.

From the standpoint of first cost, operation, performance and life, the Reading "Tee Bar" System is a marvel in economy.

Built to conform to all Reading Standards in design and construction, the "TEE BAR" will convey your parts and products with speed, safety and at lower cost.

A complete installation at one profit.

Write for the new Reading booklet, "The TEE BAR Line."



The Reading "Alaround" Trolley with Reading Multiple Gear Chain Block

READING CHAIN & BLOCK CORPORATION

Makers of "Everedy" Electric Hoists, Gear Chain Hoists, "Alaround" Trolleys and Traveling Cranes

READING, PENNSYLVANIA
and 90 West Street, New York City

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7678—Coarse Wire Cup Brush. 5″ diameter, cup shaped, metal back. Special extra coarse wire extending 1¾″ from binding adds strength and durability.

Osborn Coarse Wire Brushes —Power Driven

The ever increasing popularity of portable grinding machines and flexible shaft equipment is opening up new fields for the use of wire brushes.

Osborn cup type brushes are now being used extensively by railroads and steel companies in connection with pneumatic tools for removing rust and scale from iron and steel before painting.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED

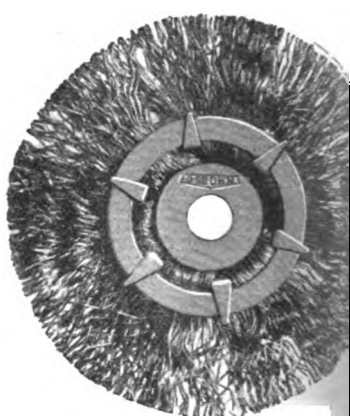
5401 Hamilton Avenue **Cleveland, Ohio**

Branch Offices:
New York, Detroit, Chicago, San Francisco, Los Angeles

Osborn Brushes



5648—"Economy" Type Steel Wire Section. Used extensively by manufacturers of electric motors for removing insulation.



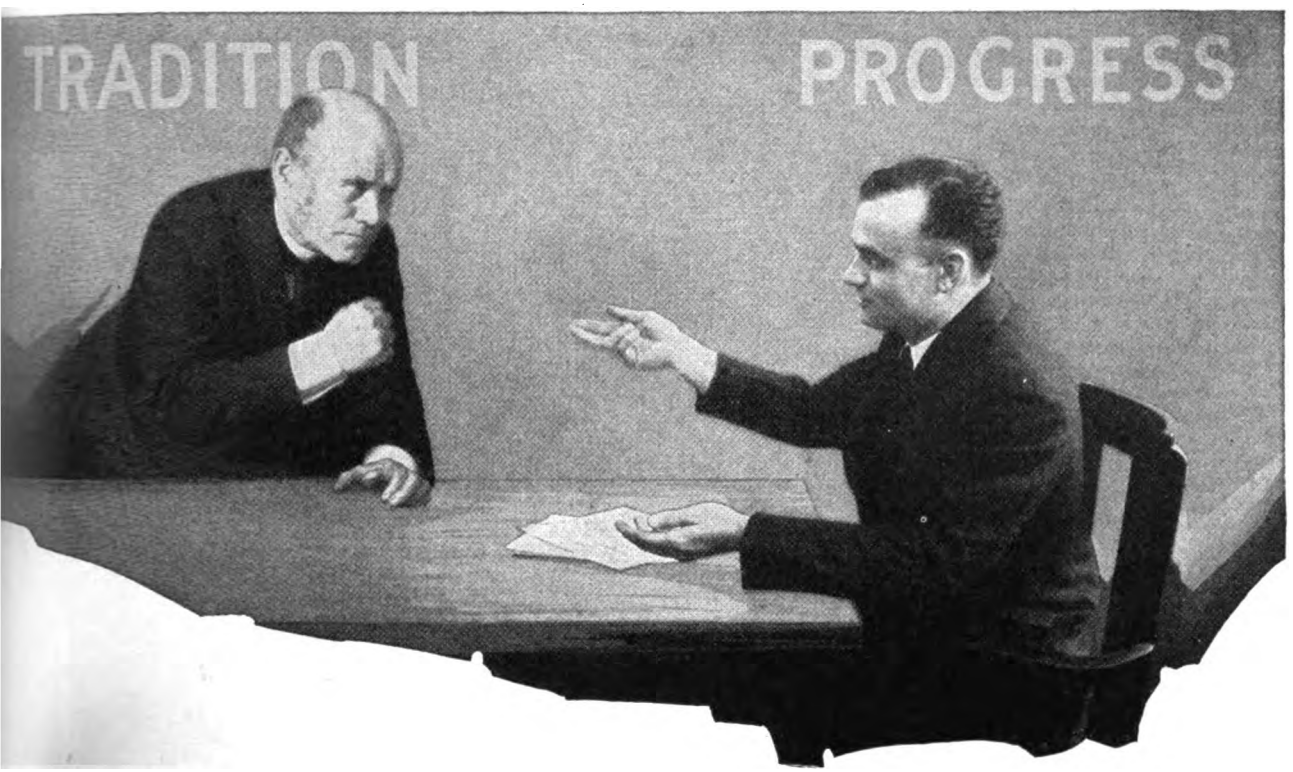
4060—Coarse Wire Section—4½″ diameter. Can be built up to any width face. Also made in 5″ and 6″ diameter.

OSBORN

A BETTER WEARING BRUSH FOR EVERY U

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Pop Cusses and Lad Discusses Insulation



'Lad—

if we had in the bank all the money e lost in machine shutdowns due to motor oubles last year, we could endow a prim- y election. Felix tells me it's all due to ie wrong kind of insulation."

"No, Pop—

it's all due to the wrong kind of motors. In all those shutdowns last year, read the names of the motors.

You don't see a "Linc-Weld" saying HERE to that mussy roll.

Those two "Linc-Weld" motors I bought over your objections had the hardest jobs in the plant and today their insulation is pliable as your ear lobe.

The Lincoln people have always led the field on insulation."

Read on Page 11 of the Motor book just why no motor can hope to beat "Linc-Weld" on this item. Your copy is waiting for you at:

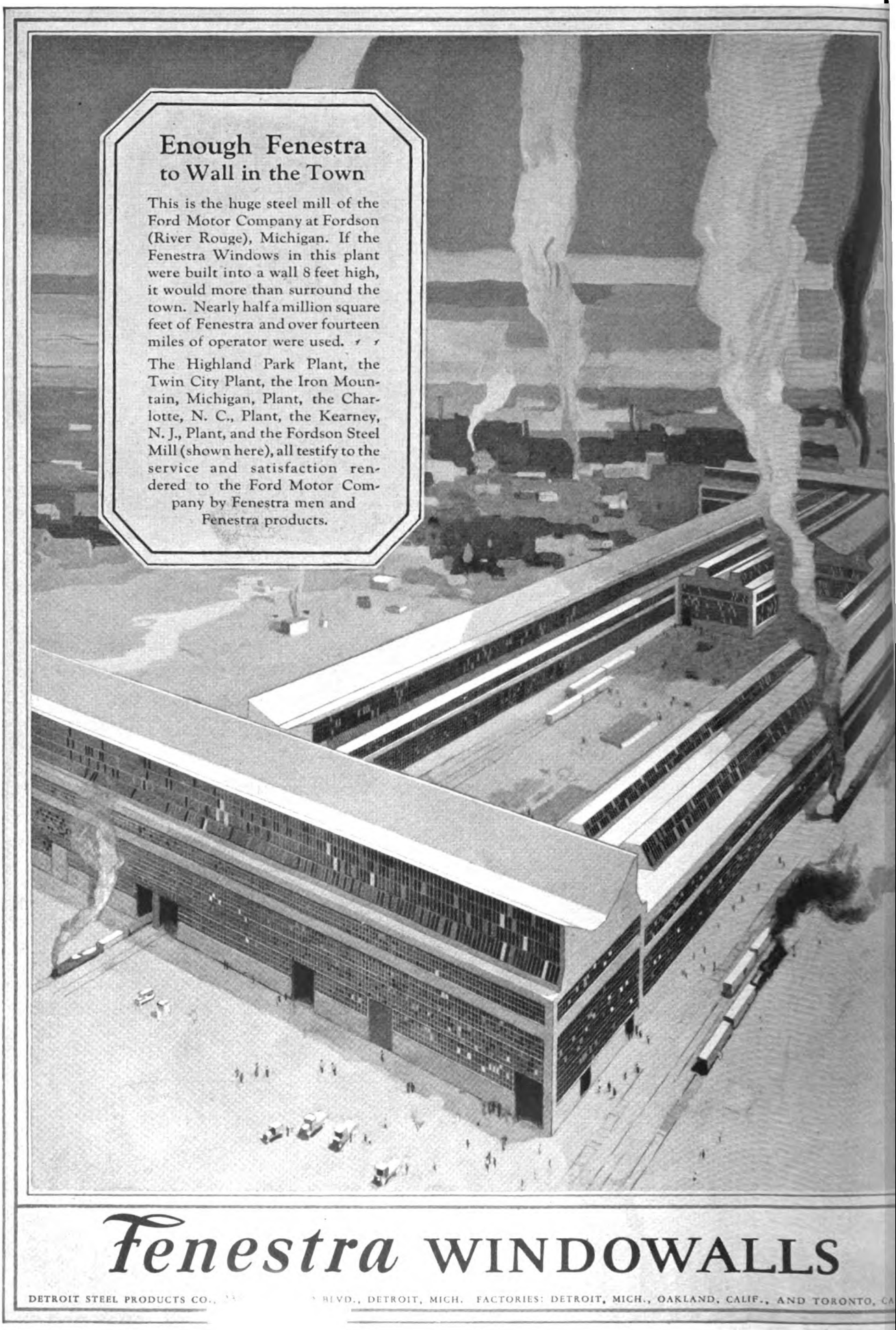
The Lincoln Electric Co., Dept. No. 18-6, Cleveland, Ohio

MA-4

"Linc-Weld"

LINCOLN MOTOR

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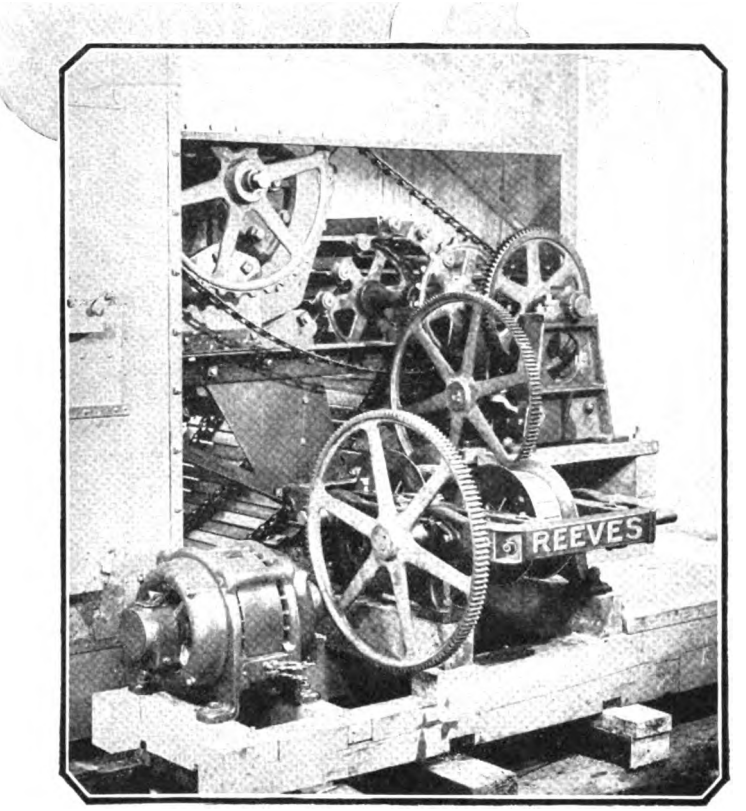
SPEED FLEXIBILITY IS VITAL!

THE REEVES Transmission is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. It does not give just *steps* in speed—but *any* speed between fastest and slowest, even to the smallest fraction of a revolution.

The REEVES may be mounted in any convenient position—on the floor, wall or ceiling—or it may be incorporated right into the machine it is to regulate. It is easy to install and simple to operate. Pays for itself in a short time. Lasts for years. Accurate and dependable, always.

In addition to the standard hand wheel control, REEVES Transmissions may be equipped with electrical remote and mechanical remote controls, so that merely by pushing a button or pulling a cable, you can regulate instantly the speed of any machine. Also, for special installations, several different types of automatic controls have been designed, eliminating the need for an operator.

The REEVES has an efficiency rating of over 96%. Force-feed lubricated—complete ball-bearing.



Any speed between fastest and slowest is available instantly with this REEVES-equipped annealing furnace at the Chevrolet Motor Car Co., Detroit.

What "REEVES-Equipped" Means

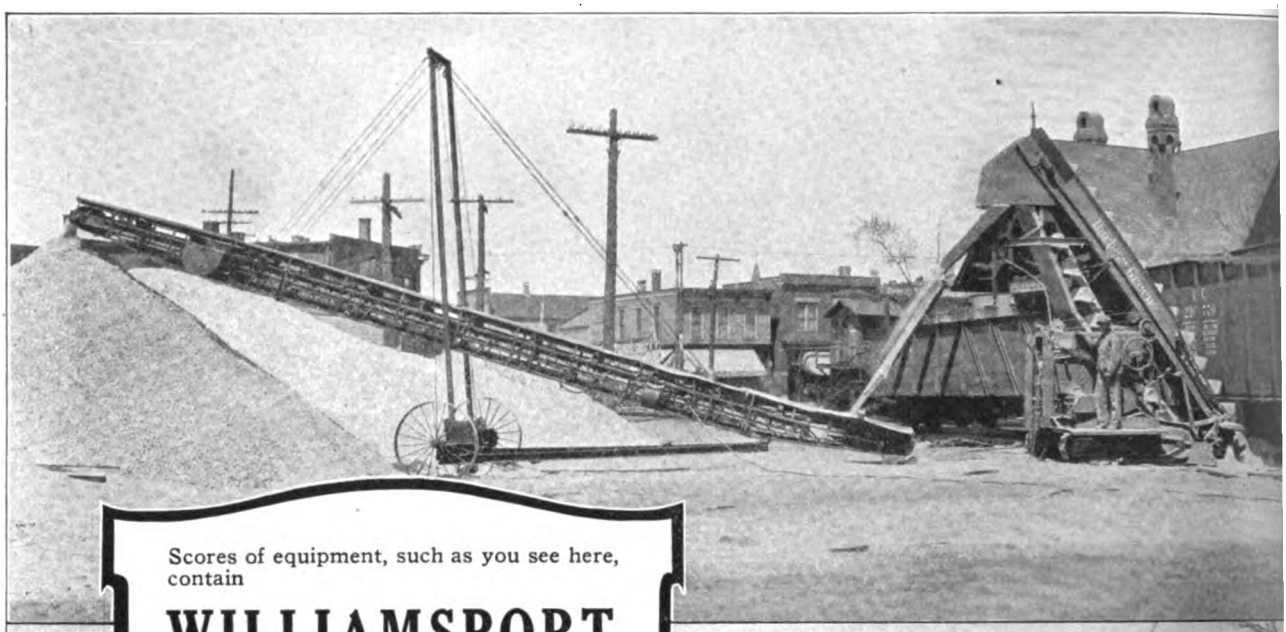
MORE THAN 350 manufacturers of machinery in over 40 industries install REEVES Transmissions as standard equipment on the machines they build. REEVES-equipped machines are absolutely *flexible*—you can run them at *any* speed at *any* time. You can adjust them instantly to meet any different operating requirement. Our catalog G-66 shows the REEVES advantages in *your* industry. Write us for it.

REEVES PULLEY COMPANY
Established 1887
COLUMBUS, INDIANA

REEVES
Variable Speed Transmission

INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

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Scores of equipment, such as you see here, contain

WILLIAMSPORT WIRE ROPE

Telfax Tape Marked
Factory Certified

as part of the standard equipment because it gives long enduring service—and the equipment manufacturer KNOWS what grade he is putting into service.

There's plenty of inferior low price rope on the market, but reliable manufacturers never compromise their product with such stuff.

And to make certain of no mistake being made, they just use Williamsport and ***Know*** the make and grade they are getting. You can easily check up any equipment using Williamsport Wire Rope by looking for the tape in the core of the rope—That's your guide to quality. It's pretty certain the equipment is good where Williamsport is used—

We show here, equipment, of the Barber-Greene Company, who have used Williamsport ropes for years—

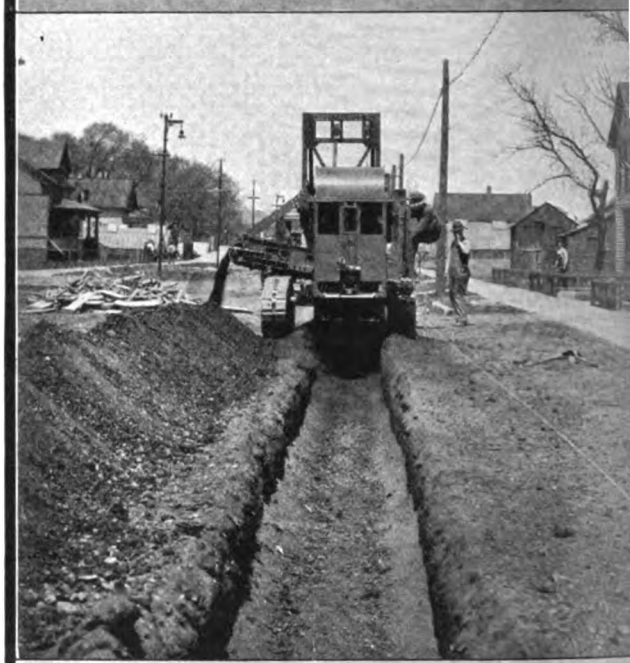
They don't compromise with quality.

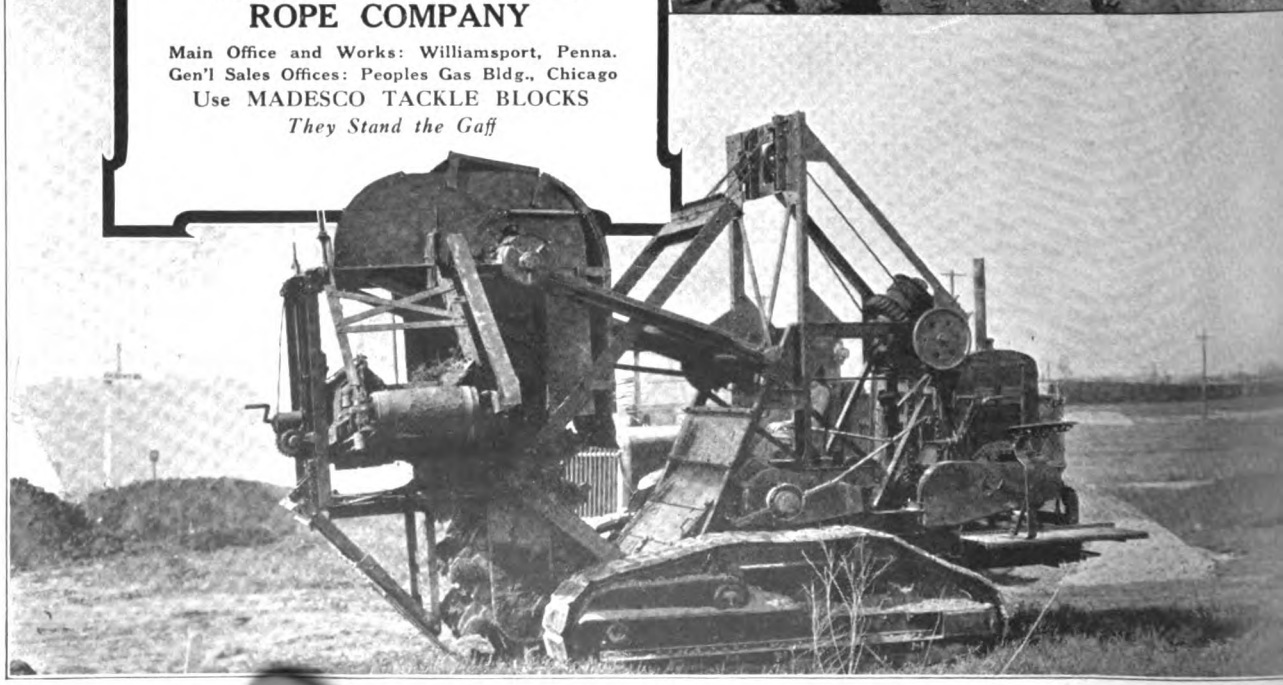
WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works: Williamsport, Penna.
Gen'l Sales Offices: Peoples Gas Bldg., Chicago

Use MADESCO TACKLE BLOCKS

They Stand the Gaff





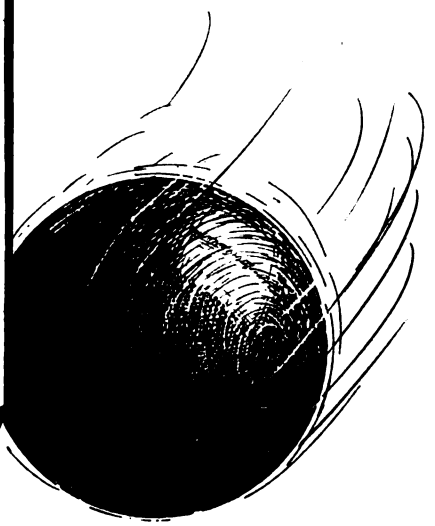
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Spins Like a Top

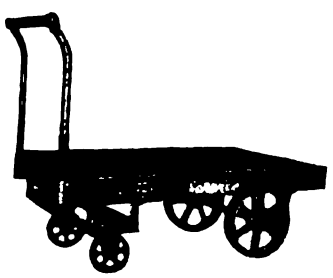


Takes Every Load



Rolls Like a Ball

Service Casters



Service Push-E-Z Trucks with Service Ball Bearing Casters carry a load of 4500 lbs. and this is conservative. They start and roll with but slightly over one-half of the pull exerted in moving the average trucks. Built for use and abuse for years to come.

—are built to withstand every possible use and abuse in present day Industrial Plants.

Service Casters roll easier, turn easier and last longer. A circle of steel balls rolling in steel raceways carries the load between top plate and yoke. A Timken bearing absorbs all side thrust and friction on the lower side of the yoke. A Hyatt bearing smooths out the miles the wheel must travel. A frictionless caster that will give unfaltering service and easy performance day in and day out, month after month, over a long period of years.

We unreservedly guarantee them and replace without question.

If you need casters for platforms or trucks, or if you are buying new equipment be sure to specify "Service Casters" and then forget them.

Don't put it off! Clip the coupon for Catalog, prices, and complete information.

THE SERVICE CASTER & TRUCK CO.
519 No. Albion Street Albion, Michigan
Sales Offices and Distributors in All Principal Cities

SERVICE
Casters *and* Trucks

SERVICE CASTER & TRUCK CO.
Albion, Michigan

Kindly send me without the slightest obligation, full information on:

- ☐ Service Ball Bearing Casters
- ☐ Service "Big Pat" Trailers
- ☐ Service Push-E-Z Trucks
- ☐ Service "Big Mike" Tri-wheel hand trucks

Name .....

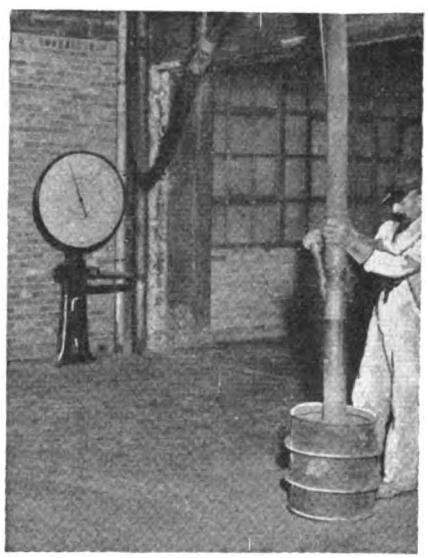
Firm .....

Address .....

I.I. 6-27

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UPPER. Dracco receiver showing rotary discharge lock. Note heavy, strong construction.

LOWER. Convenient method of handling material in plant—man operating valve in hose.

Dollars from Dust—

It's all in the way your material is handled

IT'S not so many years ago, and in fact, some plants still have their gang with shovels who transfer powdered products from the car to the storage bin via the wheelbarrow and elevator.

A vast amount of the material is lost in transit. Dust and dirt is scattered about and a great amount of time and labor is required for the operation.

Compare this with the modern Dracco method of pneumatically handling granular products.

One man and a hose empties a car in a fraction of the time required by the gang.

There's no dust or spillage, operation is automatic and sanitary from collecting nozzle to disposal in storage compartment.

The illustrations show part of a Dracco system at the Pittsburgh Plate Glass Co. In this instance Litharge and White Lead are handled at the rate of 3000-6000 pounds per hour. There's a distinct saving evident in labor, material and time.

You will profit by investigating the possibilities of Dracco material handling for your plant. Let our engineers show you what Dracco is now doing for many prominent manufacturers. No obligation.

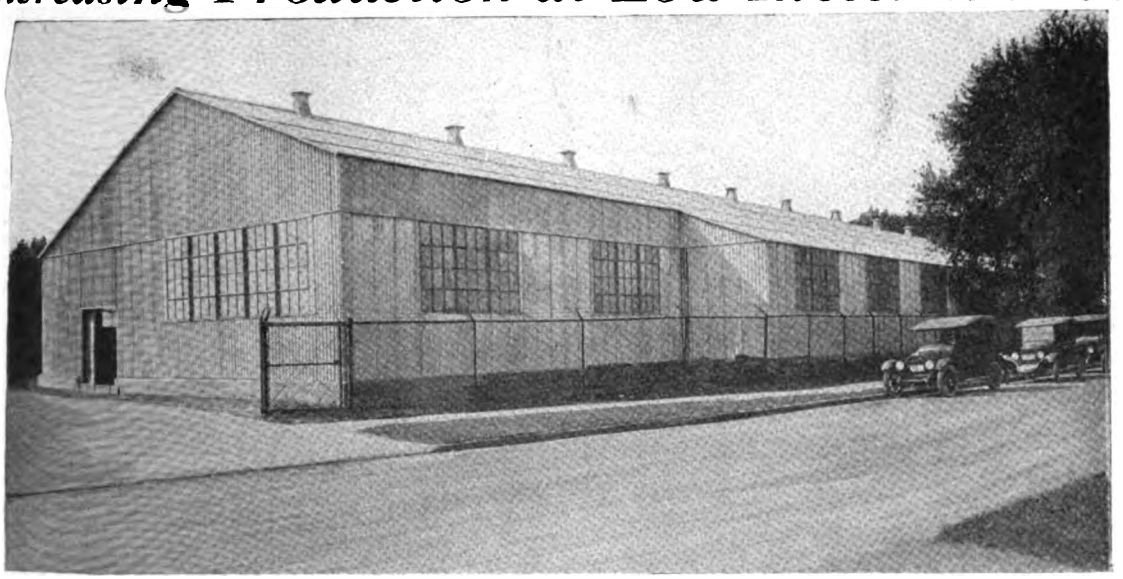
The Dust Recovery & Conveying Co.

Harvard Ave. and East 116th St.
Cleveland, Ohio

DRACCO DOES IT

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Increasing Production at Low Investment Cost



Maryland Metal Building, size 40'x 60'x 90'x 12', erected for U. S. Hoffman Machinery Corporation, Syracuse, N. Y.

SPEED

WHEN increased production becomes a problem for immediate solution—when more factory or warehouse space must be secured—the time factor enters in for serious consideration.

Next in importance to the economy and permanency of a Maryland Metal Building is the speed—the quick solution of space problems which these sectional buildings provide.

A large stock of standard parts is kept always on hand. As a rule, Maryland Metal Buildings can be delivered and erected in from ten days to four weeks.

Your particular need—from the standpoint of space requirement, cost limitations and time factor—is filled completely through the service and the facilities behind Maryland Metal Buildings.

Ivanore Metal
an alloy
The Corrosion-Resisting Alloy

with which they are covered, takes the Maryland Metal Building out of the class of ordinary sectional steel buildings. Write today for full information regarding the Maryland Metal Building for your purposes. It will pay you.

Mail the Coupon!

MARYLAND METAL BUILDING COMPANY

Main Office and Factory, Baltimore, Md.

30 Church St., New York 716 Pennsylvania Bldg., Philadelphia
419 Rhodes Bldg., Atlanta, Ga.

IG
6-27

Maryland Metal Building Co.,
McComas and Race Streets,
Baltimore, Maryland

Please send us a copy of your catalog. We are interested in a building, size..... x.....to be used as..... What would such a building cost?

Name _____

Firm _____

Address _____

MARYLAND METAL BUILDINGS

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Three Dominant Features (SPEED — POWER — EASE OF OPERATION) **place the New Clipper No. 8 Speed Lacer in a class by itself.**

SPEED: **This new machine laces both ends of any belt up to 8 inches in width in 1 ½ minutes.**

POWER: **45,900 pounds pressure, the weight of 300 men is developed by a new principle.**

EASE OF OPERATION: **One man operates it easily.**

Weight 100 pounds. Price on application.

Every lacing requirement is anticipated by the Clipper Belt Lacer Company. The use of Clipper Products is an assurance of increased production, efficiency and economy in plant operation.

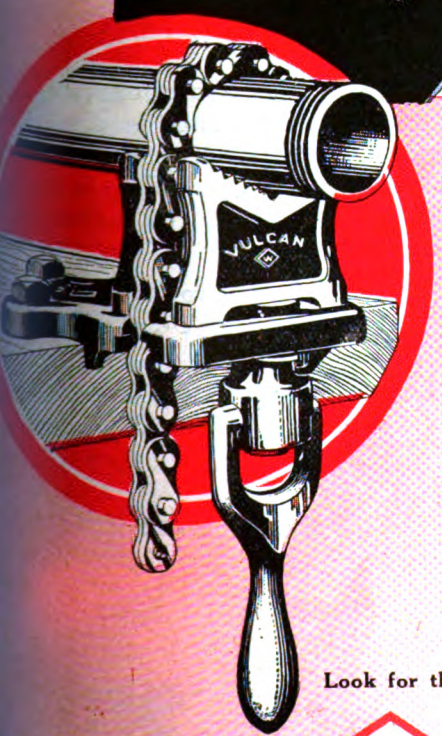
QUALITY BELT LACING

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

Clipper
No 8 Speed Lacer

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Lightning *Speed* on the job



LIKE a flash the GENUINE Williams' "Vulcan" Vise catches pipe in an unbreakable grip. A quick turn of the handle and it's free again. That's one feature of "Vulcan" service—lightning speed on the job and sure-fire grip.

Strength is another necessary point in which the "Vulcan" Vise excels. Wrought steel construction throughout with drop-forged base, jaws and handle. Genuine "Vulcan" chains. Every part is guaranteed. Install them in your shop. They'll prove time and labor savers from the start. We'll be glad to send you illustrated literature. Write TODAY.

J. H. WILLIAMS & CO.
"The Drop-Forging People"
New York BUFFALO Chicago

Look for this
W
Trade Mark

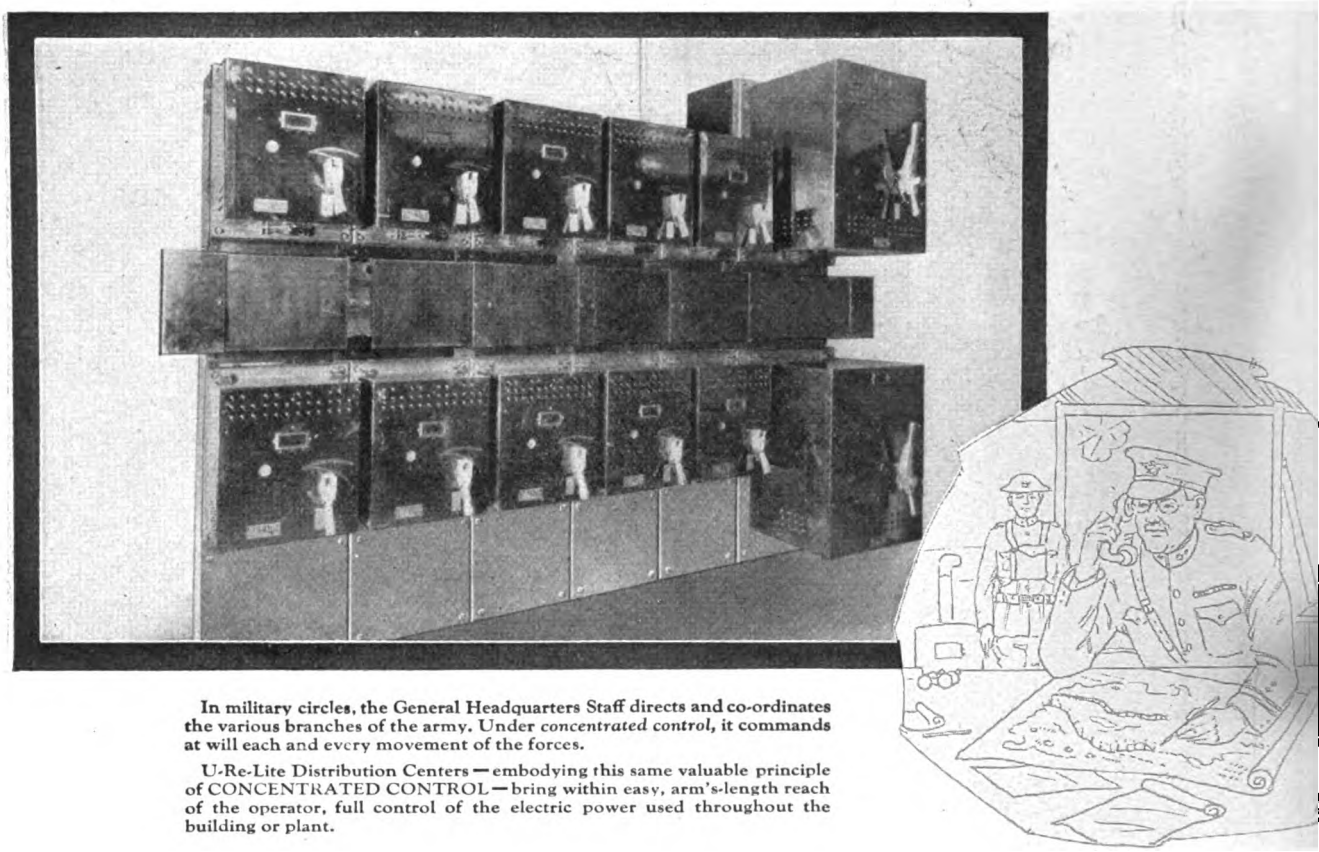
WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"VULCAN"
DROP-FORGED
CHAIN PIPE VISE

Four sizes for ½" to 8" pipe

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CONCENTRATED CONTROL

DISTRIBUTION U-RE-LITE CENTERS



In military circles, the General Headquarters Staff directs and co-ordinates the various branches of the army. Under *concentrated control*, it commands at will each and every movement of the forces.

U-Re-Lite Distribution Centers—embodying this same valuable principle of CONCENTRATED CONTROL—bring within easy, arm's-length reach of the operator, full control of the electric power used throughout the building or plant.

AN entirely new idea of simplified power distribution—of absolute control—of perfect safety—has been realized since the introduction of U-Re-Lite Distribution Centers.

U-Re-Lite itself is the finest piece of electrical protective equipment ever devised to safeguard against "shorts," overloading and single phasing. And placed together on one compact switchboard, a group of U-Re-Lites—controlling a group of machines or motors—becomes a "fool-proof," trouble-free, labor-saving Distribution Center that speeds up production and cuts down overhead.

Stop—Look—Study the above illustration. It the simplest, most convenient and economical wa of protecting a group of power or lighting circui Rupturing capacity assured—no fuses in the lin After an overload or "short," to restore servi simply turn the handle:

"First to the left, then to the right,
Turn the handle, and U-RE-LITE."

The Hand Book of the U-Re-Lite—a 96-pa book on short-circuit safety—will be mailed wit out charge, on request.

THE CUTTER COMPANY—*Established in 1888*—505 N. 19th St., PHILADELPHIA

CUTTER

U-RE-LITE & & I-T-E CIRCUIT BREAKER

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MEN CAN'T WORK

In Gas Masks

here is Jim down on the grinders, 's so filled up with casting dust by o'clock that he can hardly navigate.

ny in the "pickle room" is costing most double what he should, just cause it's hard to get men that ow steel to work in acid fumes.

en, too, the time study man has aced a whale of a cost on paint erations in order to keep men on e job in the paint booths. What n be done?

men could work in gas masks—t they can't. Electric ventilation the only solution.

wer costs, more efficient work-anship, better production and re-ced labor turnover are some of the results of American Blower Electric Ventilation not only in the departments mentioned above, but in every department of every business.

For over 46 years American Blower Electric Ventilation has been conquering bad air. Let American Blower engineers show you how easily you can remove the causes of carelessness, fatigue and sickness, by exhausting bad air, dust, dirt and fumes. Electric Ventilation speeds up production, "peps" up employees, and increases efficiency by furnishing an abundance of invigorating oxygen to every out-of-the-way corner.

Sign and mail the coupon, or ask your electrical dealer or heating and ventilating contractor.

Frequency of Air Changes Necessary for Various Applications *

Offices	5 to 10 minutes
Toilets	3 to 5 minutes
Bakeries	3 minutes
Cabins	5 minutes
Tunnels	1 to 10 minutes
Projecting Booths	2 minutes
Laboratories	3 to 10 minutes
Conduits	1 to 10 minutes
Ship Holds	10 minutes
Kitchens (Home)	2 to 3 minutes
Laundries	5 minutes
Theatres	5 to 10 minutes
Assembly Halls	5 to 10 minutes
Garages	5 minutes
Dining Rooms	5 to 15 minutes
Machine Shops	15 minutes
Lodge Rooms	10 minutes
Foundries	5 to 10 minutes
Retail Stores	5 to 15 minutes

*This table based on climatic conditions in Central United States. Other tables for specific localities are available.

C O U P O N

AMERICAN BLOWER CO., DETROIT, MICH. (10)

Send details relative to the application of American Blower Electric Ventilation to

(Business)_____

Name_____

Address_____

City and State_____

© A.B.Co. 1927 (631)

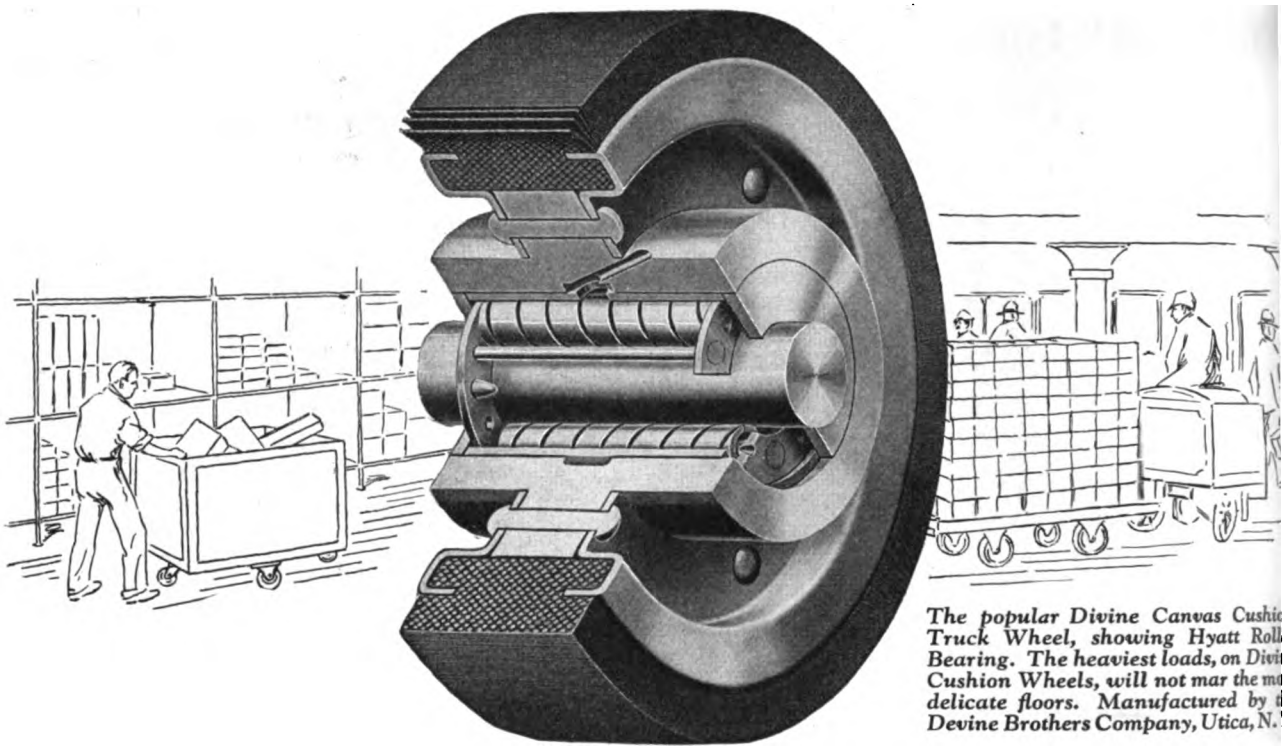
American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

Manufacturers of all Types of Air-Handling Equipment — Since 1881

OOD VENTILATION IS ONLY GOOD BUSINESS

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The popular Divine Canvas Cushio Truck Wheel, showing Hyatt Roll Bearing. The heaviest loads, on Divi Cushion Wheels, will not mar the ma delicate floors. Manufactured by t Devine Brothers Company, Utica, N.

Hyatt equipped trucks are popula

MOST prominent builders of trucks, trailers, and truck wheels furnish Hyattized equipment because Hyatt Roller Bearings can be depended upon for uninterrupted service throughout the life of the truck no matter how abusive the working conditions.

Hard daily poundings mean nothing in their long lives. The sturdy Hyatt rollers are built to absorb these shocks, and keep them from racking the truck and its load.

Hyatt Roller Bearings, with th easy rolling motion, are practic frictionless and conserve power. T are easier on the men as well as trucks.

Faster, smoother, steadier mate handling is inevitable.

In winning and holding the fidence of leading truck and t wheel manufacturers Hyatt again justified the importance of buil truck performance and profits f the bearing points.

HYATT ROLLER BEARING COMPANY

NEWARK CHICAGO PITTSBURGH DETROIT
OAKLAND WORCESTER CLEVELAND PHILADELPHIA

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

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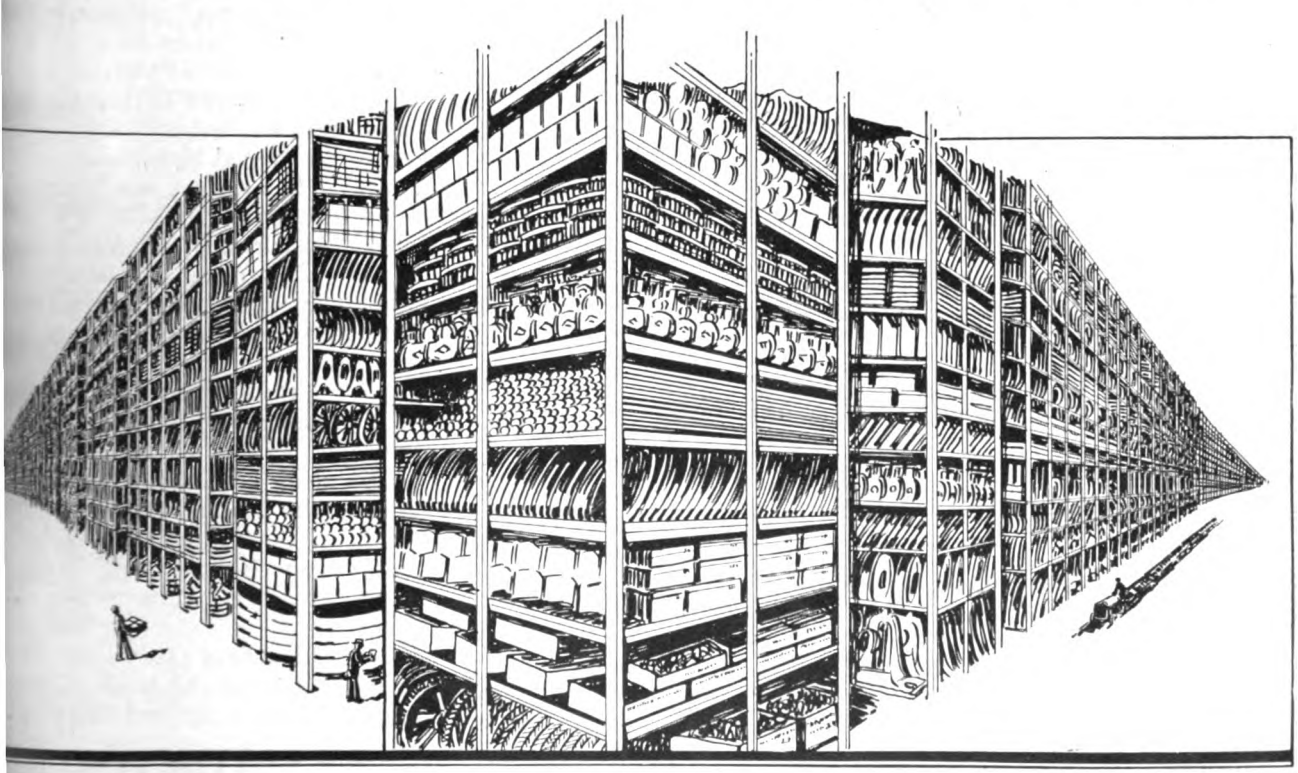
The Logical Source of Supply
for Industrial Machinery, Tools and Equipment

ARE you fully acquainted with the service that the Machinery and Mill Supply Distributor can give you? Do you know that the average distributor has been in business from 25 to 50 years; that his investment represents many thousands of dollars? You will find that in nine out of ten cases his capital investment represents over one million dollars.

Many distributors have 10, 15 or more salesmen on their payroll ready to give you more than your share of service. They maintain enormous stocks in their warehouses which guarantee that almost any of your requirements—transmission, machinery, power equipment, machine tools, shop tools, maintenance supplies or, in fact, anything used in the mill, shop and factory can be obtained from stock at short notice.

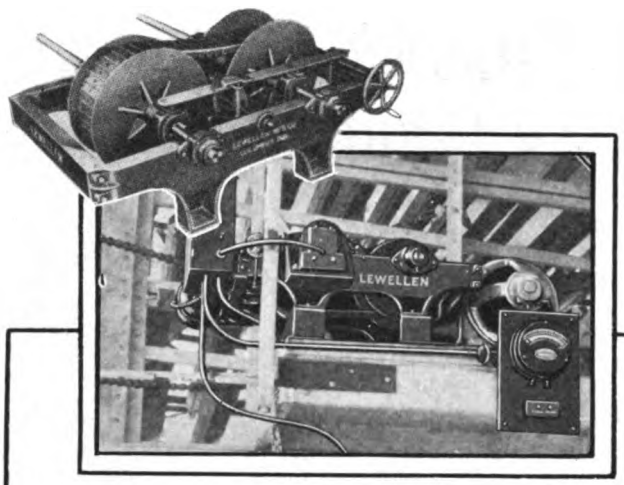
It will pay you to get better acquainted with the distributor and his service.

Buy from the Machinery and Mill Supply Distributor



One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor

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Speed Controlled thruout the Plant with

LEWELLEN TRANSMISSIONS

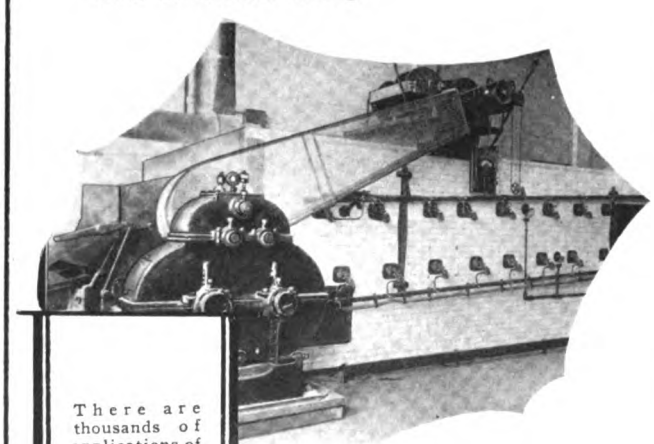
In the modern baking plant Lewellen Variable Speed Transmission performs an important function. In a letter from The Stroehmann Bros. Bakery, Williamsport, Pa., they tell us

"The range of baking time may be from ten to sixty minutes and the Lewellen Transmission gives greater flexibility in this travelling plate oven, enabling its uses for a variety of goods, each requiring a different baking time."

In every industry there is need for Lewellen Transmission for speed control and reduction. Lewellen Transmissions are sturdily built and designed with exceptional simplicity. They are good for many years of hard service.

All bearings on Lewellen Transmissions are ball bearings.

Write for Lewellen Catalog.



There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN MFG. CO.
Columbus, Indiana

LEWELLEN
Variable Speed
TRANSMISSION

The Salesman Goes Callin

By P. F. Jerome

General Purchasing Agent, National Council of Y. M. C. A

THE man whose profession is spending money likely to have his daily routine frequently int rupted with suggestions as to how to spend it. Th suggestions stare him in the face in every advertisem in the morning paper, the weekly periodicals, the tr journals, the day's mail, etc. These sources speak th own message and are quickly dismissed or clipped filed for reference.

Another group of aids in spending money is salesman whose name is legion and whose daily calls purchasing agents help break up the monotony of d deals in money for merchandise and service.

These salesmen are interesting because they are hu and they are as varied as there are individuals. S we begin our daily interviews?

"There's a salesman waiting to see you," annou the reception clerk. You take his card and size up quality as you read the name of the stranger. It cheap printed card in two colors and you decide are not interested in rubber stamps or key tops for t writers.

"A gentleman to see you," is the next estimat the clerk. This time comes a business card with name of a man in heavy engraved letters and dow the corner appear the words, "Special Representati You rack your brain to think where you have seen name before and decide to go out to the waiting r to satisfy your curiosity. The answer is a bond s man.

"This man says he wants to see you personally just two minutes," says the clerk, handing you a It is printed and soiled. You read: Alphonse Mad Steward, Marine S. S. Co. Visions of a trip to or Mexico loom up before you as you again yiel curiosity. A swarthy buccaneer is waiting to fidentially whisper to you that he has in this paper age "just two boxes left of real Havanas at $15 a just in from Cuba." He does not say, smuggled as a favor they are both yours for $20. The repl "Not smoking today. Thank you!" Before he leav asks the office boy to get the name card back from boss." It is his only card and probably not his name at that. This story sometimes is changed and are solicited to buy a piece of "English woolen good a suit of clothes at $75, just off the steamship."

Another card is presented by the office boy. time it is a name and address written in pencil scratch pad. "He had no card," says the boy. asked him to write it out in case the boss want send him an order." "What does he want to "Well, he wants to go through the offices and take for silk hosiery for the stenos." "Turn the hose on suggests the buyer.

The personality of the calling card is apt to the personality of the salesman and helps to creat impression in favor or against the first call of a man.

The purchasing agent is not a difficult man to s important and legitimate matters. If a firm's repr tative has no appointment and presents a dignified in nine cases out of ten, he will get to see the buyer

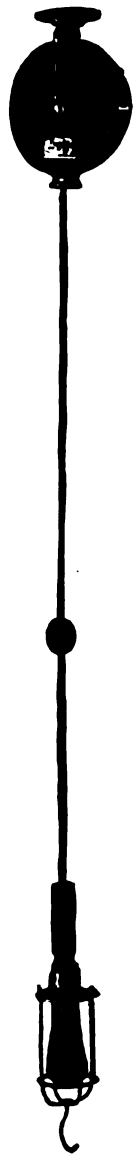
ts not advertised in this issue write Industry Illustrated

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Reelite

REG. U.S. PAT. OFF.

"Carries current where needed"



A device which carries electric current wherever it's needed, yet which automatically tends the cable or cord, keeping it out of the way at all times.

An automatic spring reel constantly takes up the slack wire, coils it out of the way, clean, unkinked, ready for instant use.

The smaller portable types of Reelite (similar to that shown at the left) are widely used in garages, machine shops and factories where it is desirable to bring light close to the work being done without having lengths of cord trailing over the floor or work bench. Portable Reelites are also furnished with a connector to supply power for portable tools such as motor-driven drills, screw drivers, etc.

The larger "Constant Duty" types are used on all kinds of travelling or portable machinery where power must be supplied to a moving machine. Reelites of this sort will often save their cost in a year by cutting down cable-renewals. Particularly useful for portable hoists, travelling cranes, lifting magnets, boring mills and mobile transfer cars.



Send the coupon for our new descriptive pamphlet which shows all types and sizes. There is no obligation, of course.

APPLETON ELECTRIC COMPANY

1716 *Wellington Avenue* · *Chicago, U. S. A.*

New York—150 Varick St. Los Angeles—340 Azusa St.

UNILETS

Registered U. S. Patent Office

"Standard for better wiring"

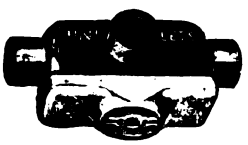
This famous Appleton line of electrical conduit fittings has long been preferred by contractors for large and small jobs alike.

Unilets are always uniform in size, well finished, easy to install, light and strong.

Two types are available: One of drawn steel with standard, threaded hubs; the other of malleable iron with our perfected No-Thread hubs.

The latter are particularly useful where speed is essential. They eliminate all threading of conduit because the hub acts like a vise and grips the end of the conduit with a tight grasp which will not loosen. Triple beading inside the sleeve bites through conduit enamel and forms a perfect ground.

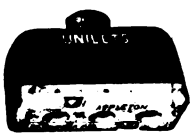
Standard Unilets are cold-drawn steel shells with thin, tough walls that have a maximum of working space inside. Their edges are smooth and regular, their bottoms perfectly flat. Workmen prefer to work with them.



TYPE "T"



TYPE "LL"



TYPE "A"



TYPE "NTFS"



TYPE "NTGNT"



TYPE "NTC"

Both standard and No-Thread Unilets are made in a full range of shapes and sizes to meet every condition of modern building. A catalog showing the full line will gladly be sent to you upon request. Just check the coupon and mail it in.



APPLETON ELECTRIC CO.
1716 Wellington Ave., Chicago

Gentlemen:

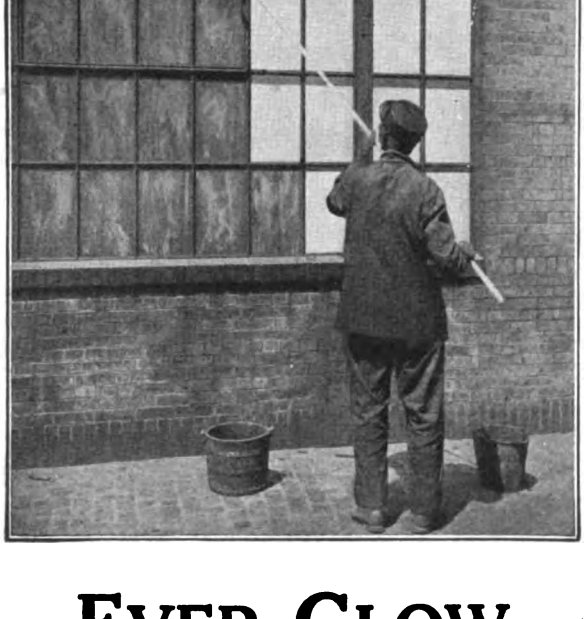
☐ Please send me your Catalogue No. 9-S on Unilets, etc.
☐ Please send me your Bulletin No. 501-S on Reelites

*Name*_____

*Address*_____

*City*_____ *State*_____

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EVER-GLOW
Cleans
Factory Glass and Skylights

Immediately dissolves grime, carbon or rust scale without injury to paint or sash.

An ideal and economical cleaner for Factories, Warehouses, Machine and Forge Shops, Iron and Steel Mills, Foundries, etc.

No Rubbing—No Scrubbing

Coat dirty glass with EVER-GLOW, then rinse with water, and glass is clean.

5 Gallons Cleans 4500 Square Feet

Average cost material and labor less 1c. per sq. ft.

One application of EVER-GLOW Super Glass Cleaner will convince you. ORDER TODAY.

TRIAL OFFER

Let us ship you 5 or 10 gallon keg with Brush Free, on approval at $2.75 per gallon. If after using two gallons you are not fully satisfied return balance within 30 days collect for full credit.

Barrel Lots $2.25 per gallon
All Prices f.o.b. Cleveland, O.

EVER-GLOW COMPANY
623 Union Bldg., Cleveland, Ohio

sonally or get a prompt answer as being "not interested today." Some salesmen are led to believe that they must see the buyer every time. Some want to exercise their powers of persuasion on the purchasing agent in discussing a subject on which is closed at the time. In some cases the salesman insists on seeing the purchasing agent and then the purchasing agent will reluctantly drop pressing duties to personally assure the salesman that time is fleeting and other calls must be down on the salesman's list for the day. The waste of time by some salesmen who insist on telling the whole story, parrot like, reminds me of the procedure adopted by a buyer who has a general rule of meeting such salesmen in the waiting room and conducting the interview while standing. This means getting quickly to the point and a quick decision, saving time for both.

A salesman has the same chance in getting an enthusiastic reception as a snowstorm at Palm Beach when he turns up in the reception room at five o'clock with the purchasing department all set for the 5:15 train. This practice prevails among some commuting salesmen who canvass the firms in the Grand Central and Pennsylvania Station districts on their way home at night. Sometimes the practice is reversed and the salesman commuter calls direct from the station while the morning mail is being read. The reception clerk may offer the waiting salesman a drink of ice water in harmony with the appropriate temperature of such early or late calls.

Another salesman will insist on shaking hands and greeting you like a long lost brother and follow up by saying he was just up in this neighborhood and thought he would drop in to see you. You cannot help thinking that if there had been an open coal hole, in the sidewalk he might have used it for the same purpose. An incidental call is not nearly so complimentary to the buyer as a special call on purpose, to see the buyer. In self protection some buyers have adopted the plan of keeping the hands in pockets or behind the back, or carrying papers in greeting pumphandle salesmen.

Other salesmen seem to operate on the basis that selling goods is a social pastime and the scheme is to be frequently dropping in on a buyer for a friendly visit and hoping he will eventually get an order. Sometimes the social caller adds the numerical idea that if he makes calls enough each day he must surely get some orders. This sort of order-taker usually has to take the buyer's purchase order form, back to his employer to see if it will be accepted. His job is simply a grown up messenger boy. The purchasing agent frequently has to buy the vendor's merchandise without any help from the so-called salesman. This chap belongs to the class who will hold the door open and say, "You don't want to buy anything in my line today, do you?" A negative nod will dismiss him and he waves his hand in farewell saying, "Bye, Bye."

Here is the salesman who insists on following the suggestions in his correspondence course, by inviting himself into the private office of the buyer. His book tells him that he must aim for the undivided attention of the prospective buyer and so he tries to get him alone before starting his sales talk. Such a salesman is more easily diverted from his line of argument, than in direct the buyer's mind. The buyer feels at home in his own office. The buyer has the advantage claimed for the salesman, more often than not. Sometimes a salesman's necktie makes a diverting impression more forceful than

ducts not advertised in this issue write Industry Illustrated

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Nuttall

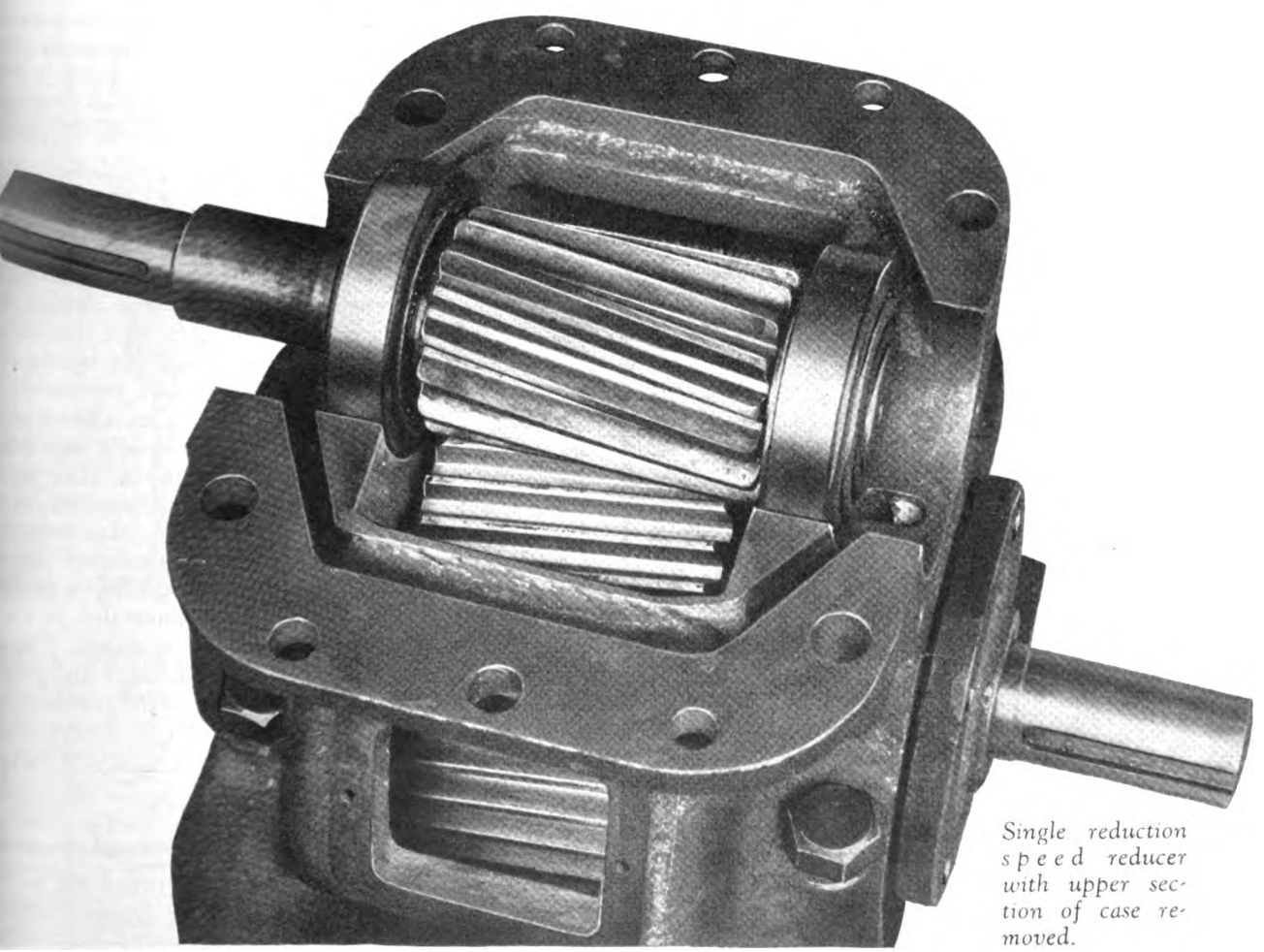
Reliable Operation

Nuttall, helical gear, speed reducers are built to give continuous, dependable service. Sturdy, smooth operating, single helical gears; Timken Roller bearings; the rugged, ribbed case; and the Nuttall system of positive splash lubrication are all combined to give a speed reducer which will operate for years with no attention beyond occasional lubrication. They are *reliable*.

Send for our bulletin No. 58

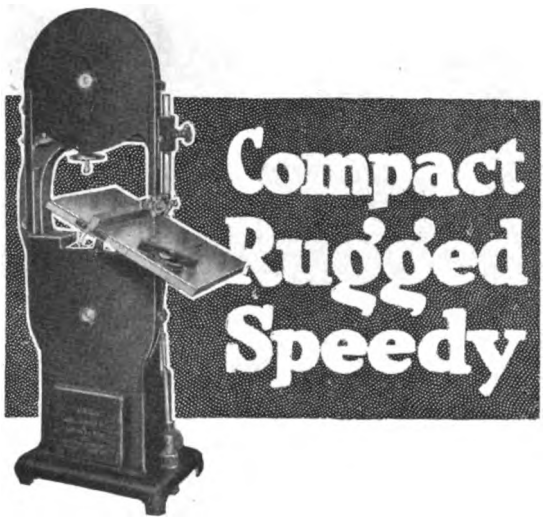
R. D. Nuttall Co., Pittsburgh, Pa.

Philadelphia—Chicago—Wilkes Barre—Los Angeles
Canada—Lyman Tube and Supply Co., Montreal



Single reduction speed reducer with upper section of case removed.

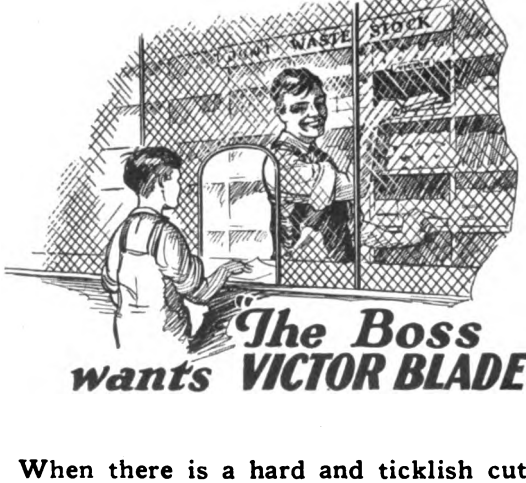
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You can save time, money and floor space with Gallmeyer and Livingston Union Woodworking machines. The smaller work you are now turning out on larger and more costly machines can be done with greater speed, and more economically with Gallmeyer and Livingston machines.

Gallmeyer and Livingston Woodworking machines are compact, and especially designed and built to reduce operating and overhead costs. In this day of keen competition every manufacturer needs machines that do cut down expenses and speed production. Gallmeyer and Livingston machines are doing it for hundreds of manufacturers. It will pay you to write today and let us show you the many advantages of Gallmeyer and Livingston machines.

GALLMEYER & LIVINGSTON CO.
412 Straight Ave., Grand Rapids, Michigan



"The Boss wants VICTOR BLADES"

When there is a hard and ticklish cutting job to be done in the shop, the boss will ask for Victor Blades. These blades have established themselves as a necessity in the minds of the foremen and mechanics when hard cutting jobs confront them.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

his selling arguments. The chair offered to the salesman may be unusual in style and create comment. This chair may face the light of the window and the consequent light be in the salesman's eyes. Or a hidden push button may bring into the room a prearranged interruption. A dozen apparently harmless, but disconcerting features await the unwary salesman who is endeavoring by personality and aggressive salestalk to make a sale according to the outlines in study course. The sales suggestions on approach, attention, arguments and closing, etc., are all familiar to the purchasing agent and are anticipated and identified when used by the routine sales agent. These instructions to salesmen are relics of the period before the war and may have some continuing usefulness in retail store circles, but to attempt to apply the sales talk in dealing with industrial buyers is an amusing waste of words.

As a matter of prophecy, if not already a fact, is not the selling game in general greatly overemphasized in its importance in modern industrial circles? May we not expect a reduction in the number of employed salesmen as a natural result in the campaign to reduce waste and assist in the more economical distribution of merchandise. With the development of the plan of centralized buying under the direction of a trained and responsible purchasing agent, modern industry is beginning to buy its raw materials and merchandise on a scientific basis. The buyer knows exactly what he wants and then buys it. With the assistance of the National Bureau of Standards, he has available specifications covering all the items which he buys. The buyer knows the sources of supply and invites the bids by mail. The postman carries the inquiry and the reply and eventually the purchase order to the vendor. The buyer is expected to know his own requirements better than the salesman. The salesman may help in the matter of terms and facilitating delivery but technically he has little to do with making a sale—the transaction may correctly be called a purchase and not a sale. The purchasing agent is in the market to buy. He does not wait to be advised by a salesman when to buy. He knows that.

The buyer's daily experience with a score of solicitors, novelty distributors, time wasters, etc., makes him appreciate all the more the high grade modern salesman who knows that the purchasing department is the one responsible point of contact for the sale of merchandise. This salesman is not given to deals with the foreman or engineer. He is always a welcome caller whether advising about an order or giving some friendly information on the development of his line of goods. The cultivation of mutual business interests is the object of the modern salesman's visit and he is sure of a cordial response from the buyer. This is an entirely different motive and action in comparison with that of the salesman whose manager has taught him to think that he has to bring home an order for every call he makes. The latter course is no longer possible in industry and its continuance is an unnecessary burden in the cost of distribution.

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Hundreds of Plants Now Adopt ROWELL Bottom Pour Ladles

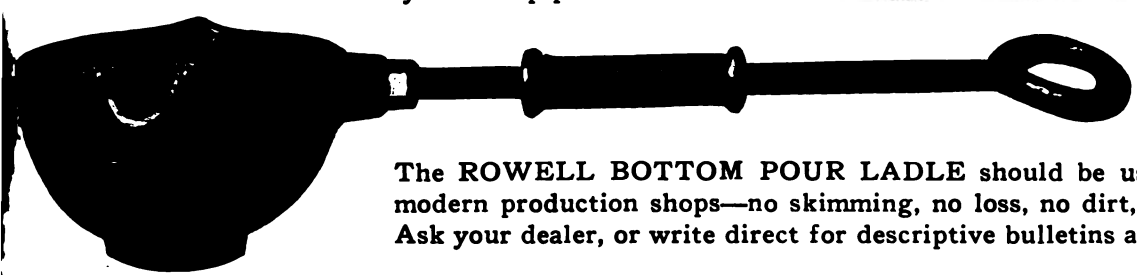
(Self Skimming)

Shops throughout the country, wherever production costs are studied and where savings in time, labor and metals are desired, are adopting the BOTTOM POUR LADLE.

The BOTTOM POUR LADLE gives the absolute assurance of safety in pouring and eliminates skimming which is necessary when top pour ladles are used.



Interior View of Ladle



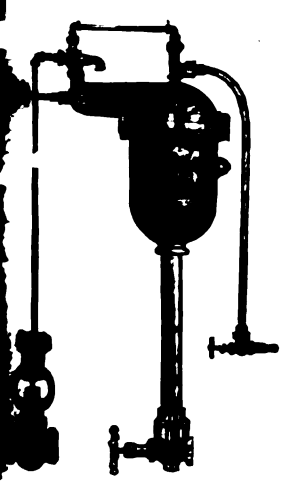
The ROWELL BOTTOM POUR LADLE should be used in all modern production shops—no skimming, no loss, no dirt, no dross. Ask your dealer, or write direct for descriptive bulletins and prices.

You know the danger associated with skimming. You can prevent many accidents by using the ROWELL BOTTOM POUR LADLE.

ROWELL MANUFACTURING CO.

APPLETON-WISCONSIN

FUEL ECONOMY



is secured when the water in boilers is maintained at a constant level. Careless hand feeding is being replaced in modern power plants by

VIGILANT *Feed Water* REGULATORS

They are always on the job and insure a constant water level. Steam production is increased, boiler strain is relieved and real fuel economy is secured.

Send for catalogue

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh

A DEPENDABLE SOURCE OF SUPPLY

GITS BROS.

Better Oilers

287 Styles & Sizes



OIL CUPS
OIL HOLE COVERS
WIRE WICK FEED OILERS
OIL RESERVOIR FILLERS

Quality Oil Cups for Every Purpose

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La Salle Grinders

For Precision and Production

No. 2 Automatic Surface Grinder

Grinds Work to
20"x6"x10" Standard
24"x6"x10" Extra
With 7" Wheel

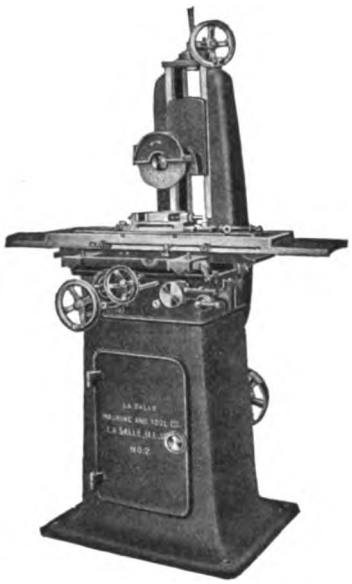


Table travels automatically in both directions. A hand - power table movement can be operated without changing automatic feed.

Also has automatic cross feed in either direction with automatic stop. Wheel truing device is built integral with machine. Price, $550. F. O. B. La Salle, Ill.

YOU WILL FIND nothing better than the La Salle No 2 Automatic for grinding dies, punches and a wide range of small tools, as well as for many manufacturing jobs. Exceptionally rigid, it has ample provision for preserving perfect alignment. Arranged for either wet or dry grinding, with belt or direct motor drive.

LA SALLE GRINDERS include our No. 1 at $115 and No. 3 Plain and Surface Grinder at $365 to $390; No. 2 Automatic Surface Grinder; and American Wet and Dry Drill Grinders in various sizes at $120 to $350—each a real leader in its class. *Write us about the capacities of these modern Grinders.*

LA SALLE TOOL COMPANY
OTTAWA, ILLINOIS, U. S. A.
La Salle County **Formerly of La Salle, Illinois**

Serviceable

Certified malleable castings —
Straight grained rock maple handles —
Special hardened steel spurs—

Plus

Careful workmanship—
Guaranteed performance—
And a liberal free trial offer.



Order the New Badger Car Mover from your jobber or—

THE ADVANCE CAR MOVER COMPANY
936 E. John Street
APPLETON, WISCONSIN

New Badger

SLIP PROOF CAR MOVERS

Bridging a River Transportation Gap

By George F. Paul

THE gap between the river barge and the railro is successfully bridged by the modern equipme that has been installed at Alton, Illinois. The mecha cal handling of river-borne freight is the solution to t difficult problem. The railroad company can eit unload the barges directly into the cars or reverse t operation and load the cargo from the cars to the barg The equipment, therefore, is both a barge unloader a loader. It is so designed that no matter how high how low the stage of the water may be, or whether boat is heavily loaded or empty, the equipment provi for these changes. When once the packages are pla on the carrier, they do not have to be touched till t reach their stopping place, either aboard the cars or the barge.



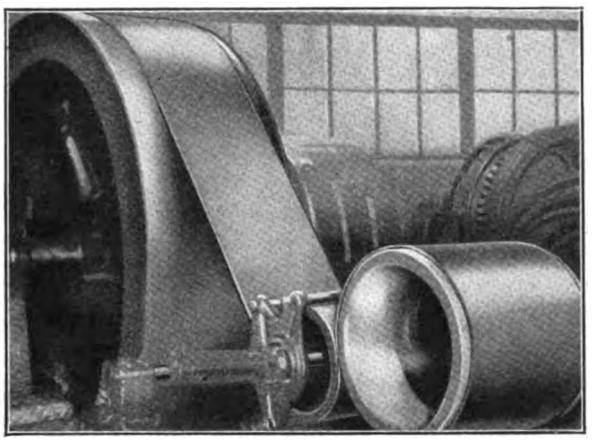
The machine is mounted on its own railway; it be moved forward or backward on the dock. makes it possible to unload or load a second barge may be berthed outside of the first barge. The e ment consists of a large self-contained power and a carrier in three sections. One carrier, the lo extends from the power frame, down through the in the dock to the barge. The second section ex the length of the power frame. This section carrier is also adjustable at the end nearest the ca that, when loading the cars, the carrier can be raise the car loaded to capacity. The longest section n the barge is raised by power and by means of a and block and tackle, as is done when the water i or when the equipment is not in use.

The equipment handles package freight up to dividual package weight of 400 pounds. The ca principle is that of the endless chain to which a tached the carriages, consisting of axles with a on either end of the axle. Each section has its se endless carriages, but all three are driven from one unit, a 15-horsepower motor.

Products not advertised in this issue write Industry Illustrated

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SCHIEREN BELTS DO LAST LONGER



The pliability of special tannages is obtainable in Duxbak Belting without having to pay the usual premium

FOR smaller pulleys and higher line shaft speeds you need more pliable belting. It must be more pliable to maintain its length of life under harder conditions.

In Duxbak Belting you get not only pliability but also the long life of the oak tannage.

The scouring process accounts for the pliability of Duxbak Belting and makes it different from all other belts. A Duxbak Belt must last longer and be more pliable just because it is scoured.

Let us send you a copy of L. H. Hopkins' article, "Group Drives More Economical for Most Conditions."

DUXBAK BELTING TRADE MARK

Chas. A. Schieren Company

Tanneries: Bristol, Tenn. Main Office and Factory 31 Ferry St., New York

Distributing Branches and Dealers in All Leading Cities Throughout the World

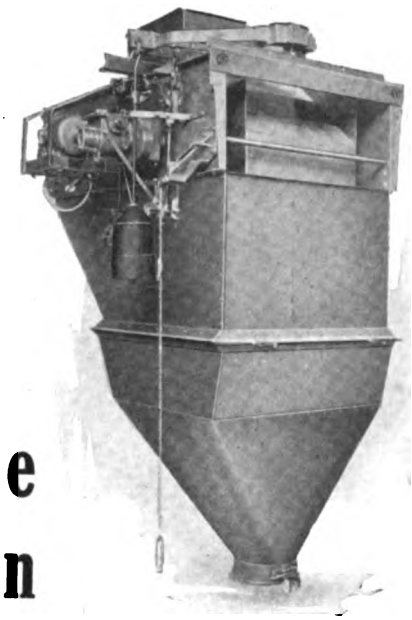
DUXBAK WATERPROOF LEATHER BELTING

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RICHARDSON

Automatic Sacking Scale

For Granular and Crushed Products



One Man

Weighs and Sacks 5 Sacks per Minute

This type of Richardson Automatic Sacking Scale used at Carnegie Steel Company, Jones & Laughlin Steel Company, Youngstown Sheet & Tube Company and in other large plants is saving labor costs and doubling the output formerly obtained in the handling of Ammonia Sulphate—a by-product of their coke-ovens.

With the Richardson Automatic Sacking Scale it is now possible to weigh, fill, sew and truck to storage or cars as many as 240 to 300 sacks of Ammonia Sulphate per hour—always saving 1 to 2 men.

This scale weighs automatically net into sacks in exact predetermined amounts. Each sack contains the exact amount—no overweights or short weights—it has entirely eliminated customer disputes.

If you are sacking Ammonia Sulphate, Flake Chloride, Soda Ash, Sulphur, Salt, Slate, Gypsum, Fullers Earth, Glue, Copra, Feldspar, Charcoal, Coke, Potash, Plaster, Nitrates, Clay, Lime, Paint Pigments, Sodium Bicarbonate, Fertilizers, etc., let us tell you how you can save labor costs in handling and sacking—increase your output and assure absolute accuracy in weighing.

RICHARDSON SCALE COMPANY
Clifton, New Jersey

New York Buffalo Chicago Boston Minneapolis
Gulfport Wichita Omaha Los Angeles Pittsburgh

British Combatting Smoke Nuisance

By B. S. Townroe

THE British Government has promised to introduce a bill to try to prevent the nuisance caused by domestic and industrial smoke. It is calculated that every year there is wasted in heating values over $100,000,000 which floats away through the domestic chimney.

Various substitutes for coal fires are, of course, installed in many homes, but in the national housing schemes upwards of 1,000,000 houses have been built since the Armistice, and it is the usual practice for a fireplace to be put in the living rooms and bedrooms. The average Britisher likes the open fire grate and cheerful coal fire, and also medical opinion takes the view that the open chimney makes for better ventilation of the room.

But Neville Chamberlain, the British minister of health, has for years past advocated in the cause of economy and of public health that smoke should be diminished. Several efforts have been made to embody possible preventative measures in legislation, but without much success.

The British Government, however, has now called science to their aid. On the building research station near Watford, scientists are testing exactly the effect upon the air of a room by closing the fireplace and simply using a ventilator. It is hoped that as a result of these experiments, scientific data will be available to show exactly the size and type of ventilator most desirable in a room where the open fireplace has been abolished. Curiously devised instruments are being used so as to test how long, for example, it takes to clear a room, without a fireplace, in which there is some noxious gas. This is one of the first examples of the new spirit abroad in Great Britain calling in science to the help of legislation.

Fireless Boilers

THE future industrial power plant will probably, some day, be equipped with fireless boilers.

Modern progress along power plant lines is certainly rapid. We are led from one remarkable thing to another with such frequency these days that most of us have steeled ourselves to expect almost anything.

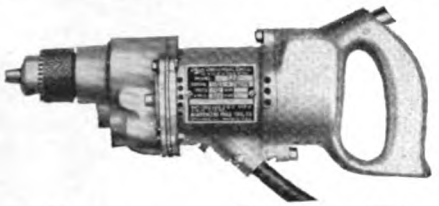
The latest sensation is a plant in Czechoslovakia which will operate with steam at 1700 lbs. per sq. in. and 650 deg. F. There will be no fire beneath the boilers. Steam will furnish steam to the 18,000 kw. turbine.

This feat will be accomplished by generating superheated steam in a separator superheater, and passing the superheated steam into the boiler, where it will bubble up through the water in the drum and produce steam at 1700 lbs. pressure. Steam will be pumped from the boiler into the superheater whence it will pass back into the boiler.

Products not advertised in this issue write Industry Illustrated

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Thor ELECTRIC DRILLS



Big Powerful Gears
Stand Gruelling Service

Work a *Thor* Drill hour after hour, day after day. Put it on the most gruelling job you have. The big powerful gears will stand a world of abuse.

The teeth are extra wide. They are made of special heat-treated alloy steel. The two radial bearings on the spindle insure permanent chuck alignment. No wobble—no breakage of drills. And for safety's sake—a 3 wire safety cable is standard equipment—shocks are impossible. Ask a *Thor* Salesman about our liberal free trial offer—or write us.

Have you a copy of our catalogue in your files?

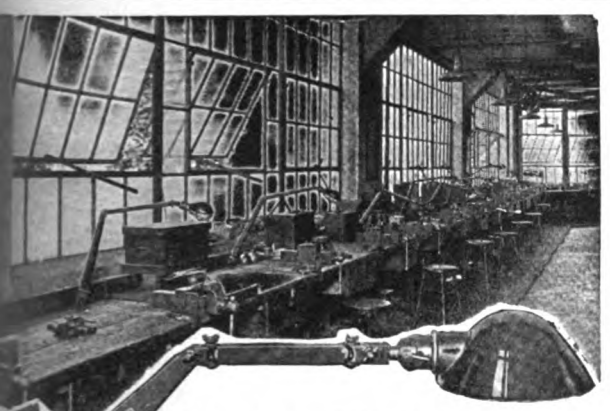
TOOLMAKERS SINCE 1893

INDEPENDENT PNEUMATIC TOOL CO.

PNEUMATIC TOOLS — GENERAL OFFICES 600 W. Jackson Blvd. CHICAGO — ELECTRIC TOOLS

FACTORY AURORA, ILL. — BRANCHES THE WORLD OVER

Eastern Office 1463 Broadway, New York. — London Office 40 Broadway, Westminster, London.



LIGHT!
where and when needed

The economy of an American System as compared with a flood light system is found in the fact that the light is placed exactly where needed, and it is used only when needed.

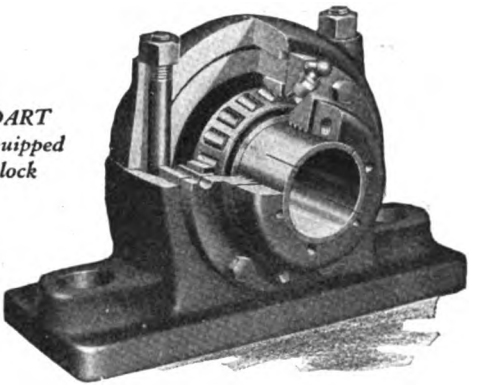
No flood lighting of great areas with the resultant shadows on the tools just where light is most needed—but light accurately placed which guarantees greater and better production.

et us make a sur-
y of your light-
g needs—write to-
y for booklets, or
representative's
rvice, or both.

American Fixture Company

230 West Water Street — Milwaukee, Wis.

The MEDART Timken Equipped Pillow Block



Easy to Apply!
Bearings Properly and Permanently Set Up

MEDART Timken-equipped Spherical Ball-and-socket Pillow Blocks come to the user filled with lubricant, ready to go into immediate line-shafting and kindred service. They can be easily applied to the shaft without disturbing any working elements—simply by tightening two smooth bored steel clamping collars. This approved construction principle insures a thoroughly tight fit of sleeve on shaft and provides a threadless sleeve that is stronger than one of the same diameter which has been weakened by threading.

Bearings are properly set up and remain permanently aligned, regardless of subsequent handling.

Highly desirable in duplicate machinery save power and lubricant—preserve alignment—eliminate wear. Can be modified to suit almost any engineering or structural requirements.

Other appliances in the Medart Timken-equipped Line of Industrial Applications are (1) The Ball and Socket Hanger for line shafting usage, (2) The Unit Mounting adapted to use in individual machines and (3) The Loose Pulley.

This added Line makes Medart a more complete source for mechanical power transmitting machinery and allied products than any time in its nearly 50 years of serving Industry. Ask for Bulletin on Timken-Equipped Line and for Catalog No. 43 on all other Medart Transmitting Equipment.

THE MEDART COMPANY

(Formerly Medart Patent Pulley Co.)

General Offices and Works, St. Louis, U. S. A.

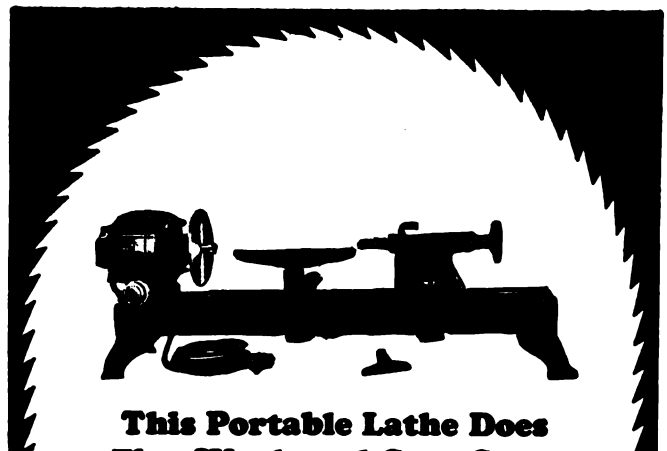
Office and Warehouse in Cincinnati—Offices in Chicago, Philadelphia, New York, Pittsburg and Seattle.

MANUFACTURERS OF POWER TRANSMITTING AND KINDRED MACHINERY

MEDART

Everything in Line Shafting Equipment

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This Portable Lathe Does Fine Work and Cuts Costs

FOR fine lathe jobs in woodworking, the H & A Portable Electric Bench Wood Lathe can be used conveniently and economically.

While performing excellent work, this machine saves time and labor and cuts production costs. Sturdily built as a self-contained unit, this lathe can be moved quickly from job to job.

Other portable electric bench machines in the H & A line, all of which reduce production costs, are the band saw, the rip saw, the swing saw and the jointer.

Send for descriptive literature on the H & A line which is sold through dealers.

HESTON & ANDERSON

613 W. Depot Ave. Fairfield, Iowa

Portable Electric H&A Bench Machines



A splendid reception

The Master *Super-Wick* Motor, announced last month, has had a splendid reception. Its unsurpassed performance, its genuinely attractive appearance and its strong, durable construction are making swift headway into the favor of motor buyers *everywhere.*

To try one is to be convinced.

THE MASTER ELECTRIC COMPANY
DAYTON, OHIO

STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Less than 40°

New Record for High-Pressure Turbines

WHAT is believed to be a new record for high pressure steam turbines will be set by the un which is to be installed by the Boston Edison Compan in its Edgar plant. This company, the first to operat a turbine under a steam pressure of 1,200 pounds, wi now add a second unit operating at the same pressur The original unit, a 3,000-kilowatt, 3,600-r. p. m., 2 stage turbine generator, was installed in 1925. The add tional machine will be of 10,000 kilowatts capacity 3,600 r. p. m. One other unit has been built for ope ation at 1,200 pounds pressure; this is a 7,000-kilowa turbine generator in service in the Milwaukee Electr Railway and Light Company station. All of these hig pressure units are of General Electric manufacture.

After a year's operation of the 3,000-kilowatt, 1,20 pound pressure turbine, the Boston Edison Compa has stated that "This high-pressure installation is not full or complete development of the high-pressure pos bilities in the Edgar station, and it is expected that a f development of this equipment will result in considera improvement in the present station economy." No di culties attributable to the high pressure have been countered, and it is no more difficult to operate such machine than one for standard pressure.

With the exception of these three turbines operating 1,200 pounds pressure, the maximum operating press in American central stations is 600 pounds, half of figure.

New Pulping Process for Paper

A NEW pulping process which produces a high y of cheap print paper from hardwoods and of the possibility of shifting the burden of newsprint p duction from spruce, which is being imported in la quantities to the hardwood forests of the North, E and South, has been developed at the Forest Prod Laboratory at Madison, Wisconsin, according to Forest Service, United States Department of Agri ture. Through the use of a rod mill, a hollow, horizon steel cylinder half filled with steel or bronze rods, h wood chips are reduced to fiber by rotating the cylin

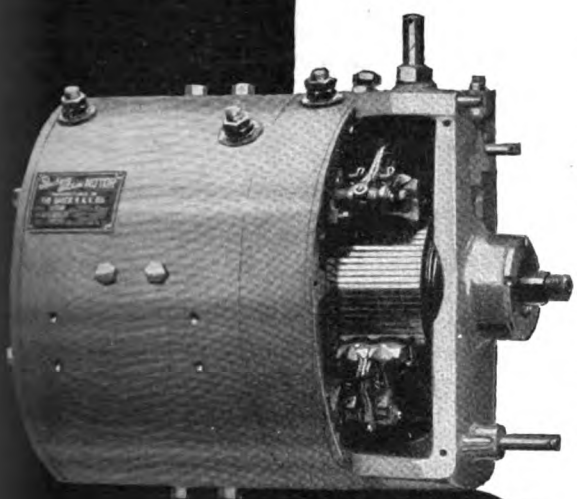
The substitution of the rod mill processing fo certain amount of chemical treatment brings about a h yield by reducing the amount of fiber which would into solution in the treating liquors in an all-chem disintegration, the Forest Service points out. The tinctive feature of the new, or semi-chemical proces that only a mild chemical treatment is used before wood in the form of chips is reduced to the proper consistency in a rod mill.

Paper of the weight and thickness of newsprint m wholly from semi-chemical pulp of black, tupelo, or gum, or aspen, birch, or maple, was found to ha greater strength than the present commercial newsp In the case of gums, the department indicates that vided black and red heart-wood have been excluded color of the paper can be made to equal or excel th standard newsprint.

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Another Advertisement for technical men only



MORE copper and more iron in a given space, ground fit between pole pieces and forged iron field ring, T-slot armature, and large brush and commutator section are the reasons for the greater power and higher efficiency of the Baker built motor used in all Baker tractors, trucks and cranes.

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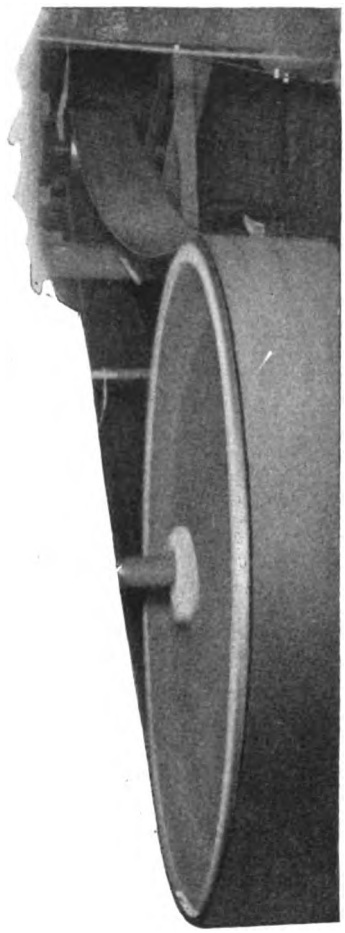
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			Square	Hexagon
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2	16"	4½ lbs.	1, 1 1/16, 1 3/16, 1¼, 1 7/16	1 1/16, 1¼, 1 7/16, 1⅝
3	20"	10 lbs.	1, 1 1/16, 1¼, 1 7/16, 1⅝, 1 13/16	1, 1 1/16, 1¼, 1 7/16, 1⅝, 1 13/16

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Changes in Patent Office Practice

By G. Willard Rich

CHANGES which will lessen the time required obtaining the grant of patents, and a simplificati of the procedure in the patent office, and the courts, w a corresponding decrease in expense to the inventor, ha been advocated by some of the leaders in the patent p fession for a number of years. The present changes the law, passed in several different bills under date February 7 and 14, and March 2 and 3, 1927, were dorsed by the American Bar Association at its ann meeting held at Denver last July.

One of the most important advances made by the r law is the requirement that amendments must be filed the inventor within six months following an action by examiner. For a number of years past the inve could allow his case to lie dormant for a year at a ti The cutting of this period in half will result in a g benefit to society in that the manufacturers, who sup the needs of the public, will, in the future, be inform of the trend of inventions in their respective lines w reasonable promptness, and in attempting to meet a p lic demand will not be forced to go blindly ahead, onl find, after thousands of dollars have been invested, some unknown and hitherto secret and long pend application has matured into a menacing patent.

The history of the development of many of the dustries of this country is replete with harrowing exp ences of expensive litigation forced upon manufactu by the grant of a controlling patent which the ow withheld from use until his competitor had gone far with his investment in plant and equipment to w draw until the aid of the courts had been invoked.

The Selden patent, for motor vehicles, is prob the best known example of this sort of an attempt t tribute upon an important industry affecting thous of people. Selden's application was pending in the ent office for seventeen years and did not emerge the automobile had been established as a public nece Opinion as to its validity was not unanimous, but merous manufacturers were compelled to pay hand royalties for a number of years, until finally the p was declared invalid. The immediate result of thi cision, after several years of litigation, was to lowe cost of all makes of motor cars.

A stride has been made in the interference pr (a proceeding in which two or more parties are co ing the question of priority of invention for the subject matter) in that, in addition to eliminating appeal in the patent office, the final appeal carrie interference into the Federal courts, where the cas be presented on the same printed record that was in the patent office, supplemented by further evi which may be taken bfore the court if such is de

It is also believed that many patents of the futur be simplified by the restrictions on the number of c demanded by the imposing of an additional gover fee of one dollar for each claim in excess of tw This, it is believed, will act as a check on over ambi solicitors.

Hereafter parties interested will be benefitted b knowledge obtained from the marking of patente

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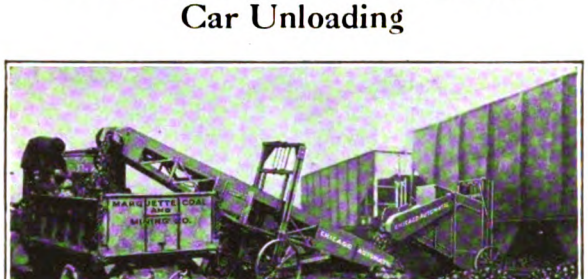
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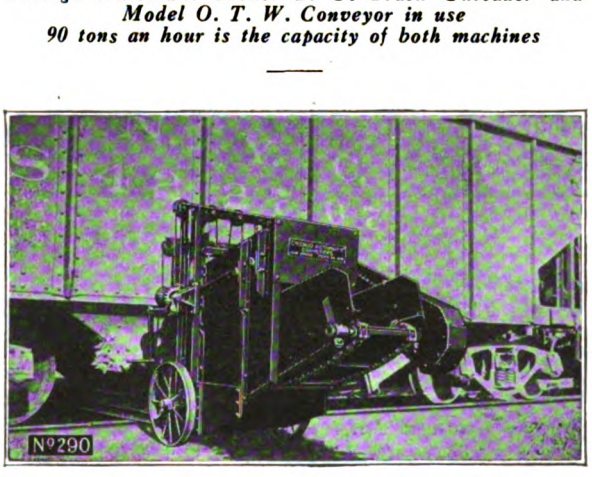
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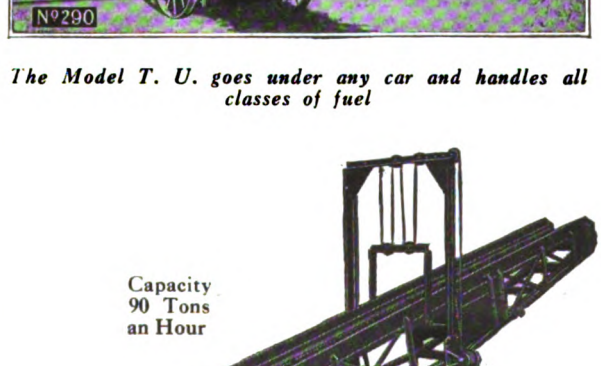
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No. 279

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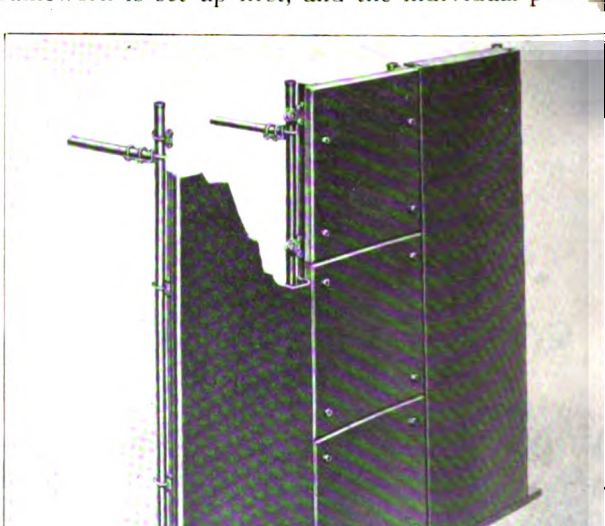
cles with the number of the patent, instead of the date, as has been the previous custom. This will enable anyone to locate a patent in the official gazette quickly and accurately. Heretofore, when only the date was given, one was obliged to tediously look through several hundred patents, often without result, as frequently a device is marked patented under an abstruse claim which might not appear in the gazette, and could be found only in a complete copy of the patent.

The practice that will now be immediately adopted in the patent office, in conformity with the new laws, will have a salutary result which will be promptly enjoyed by the ultimate consumer, since it is the ingenuity of our inventors, fostered by our system of patent protection that has placed in the hands of the American public things contributing to their comfort and happiness on a scale enjoyed by no other people in the world. The new laws will facilitate the granting of patents and thus materially shorten the time in which improved manufactured articles are brought into the commercial markets.

A New Line of Steel Switchboards

A SIMPLE construction of steel switchboard panel with several outstanding advantages, can now be furnished by the General Electric Company. The construction is such that the new board partakes of the conventional switchboard features to an extent that makes it possible even to install the new and old types together temporarily or permanently. Combinations of steel and slate or ebony asbestos panels on one board will be practicable with the use of the new design.

Pipe supports are retained on the steel panels. Each panel can be shipped completely wired without unusual care and bracing in packing. In erecting the board, the framework is set up first, and the individual panels are

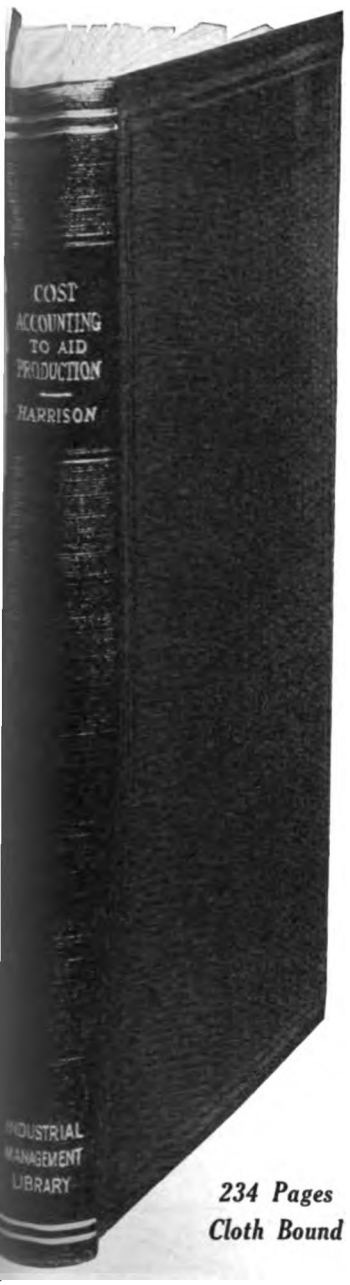


then installed. The wiring is grouped in trough-shaped recesses at the sides of each panel.

When installing slate or ebony asbestos panels

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Mr. Harrison has written his book out of his own accounting experience of some twenty years gained in widely different industries. The new methods of cost accounting which he describes, he himself has successfully applied in his own work. His whole book is based on the unquestionable fact that cost accounting should be an active part of the great process of production.

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4. Can it provide reports for the executive in such form that he will get important data relative to the business with the minimum of time on his part? Will these reports enable the executive to see at a glance the abnormal or unfavorable conditions and their *causes?*
5. Can it provide selling efficiency data by showing the profits realized: by salesmen, on different lines, by territories, by different classes of customers, or any combination of these? Does it show the standards which should be realized?
6. Is it economical in cost as regards, first, the executive's time in extracting vital information from the data compiled; second, clerks; third, shop employees' time in making out detailed time distribution reports, etc.
7. Does it have standard practice instructions so employees can easily understand the routine involved and the relation of their work to the general scheme? Can the work be performed speedily, accurately, and mechanically?

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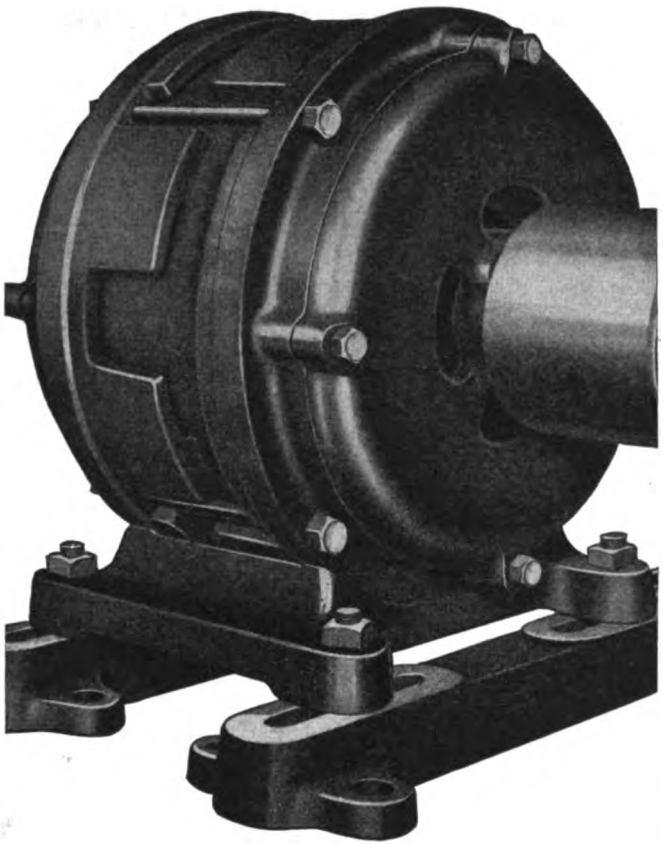
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jacent to the new steel design, the so-called angle-pipe construction of support is used; i. e., the former are mounted on light angles placed ⅛ of an inch inside the edges of the panels. These angles serve to support the several sections of the panels, and the wiring during shipment. The dimensions of the steel panels with their supporting edges are the same as those of corresponding slate or ebony asbestos panels with supporting angles. The rounded edge of the steel panel matches the rounded edge on the next steel panel, or the ¼- or ⅜-inch bevel on the adjacent old panel.

The new panels are made in standard widths of 16, 20, 24, 28 and 32 inches, with a standard height of 90 inches.

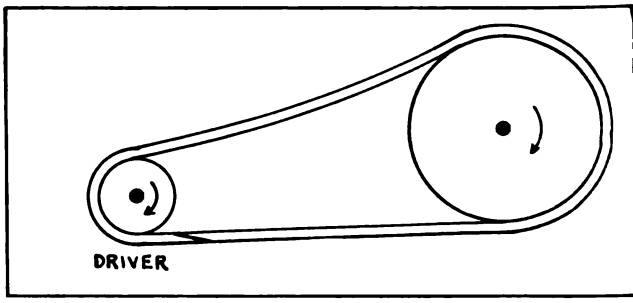
Idlers, Belts and Pulleys

By S. F. Williams

NOT long ago I read this in a prominent engineering journal: "This idler is near the driven pulleys which is contrary to the best engineering practice."

It is not poor engineering practice to place an idler pulley near the driven pulley when the driven pulley is the smaller of the two. The best practice is to always place the idler close to the small pulleys, regardless of whether it is the driven or the driving pulley.

It is also stated that if a belt is run against the lap the belt is liable to go to pieces if moisture is in the room. The direction of the lap is dependent more upon the direction of slip than it is upon the direction of motion of the belt. Since slip is usually greater on the smaller pulley than on the large pulley and since slip is always toward the tight side, it is evident that in a drive such as shown in Fig. 1 herewith with the small pulley as the driving pulley, the direction of the lap should be in the direction as indicated so that the joint will have as little tendency to roll or peel as possible.



True, when the joint is on the large pulleys, the slip is in the opposite direction and there is a tendency to peel or roll but the peeling tendency is less severe than on the smaller pulley. The direction of motion of the belt which was at one time regarded as the criterion is therefore of less importance than the question: "On which pulley is the belt liable to slip most?" The answer is: "Slip is always greater on the smaller pulley."

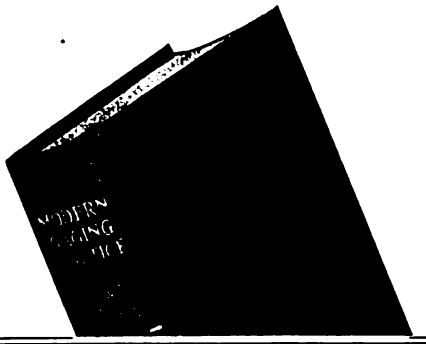
The same writer recommended facing pulleys with leather. I would discourage the use of leather covers unless absolutely necessary because such covers are conducive of excessive wear. If a drive is properly designed, if the belts are wide enough, and if the pulleys are large enough, there is seldom any necessity for leather or canvas covers.

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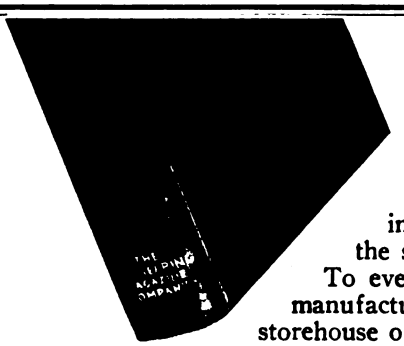
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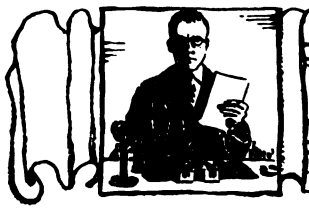
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MAINTENANCE

Paint—A wood floor preservative of unusual quality. L. Sonneborn Sons, Inc.

The Vortex Painting Method is described by The Vortex Manufacturing Company.

Red Lead Paint that can be used as a priming or finishing coat. Goheen Corporation.

Guarantee to Remain White Longest. Write for booklet "More Light." U. S. Gutta Percha Paint Company.

Window Walls—enough to wall a town are featured by Detroit Steel Products Co.

Buildings—that permit an increase in production at the lowest investment costs. Maryland Metal Building Co.

Shades—Offset wood fabric shades that bring better light and good ventilation. Hough Shade Corporation.

Blowers—Blowers and fans that cut production costs. Buffalo Forge Co.

A blower that raises the efficiency of the worker. American Blower Co.

Fans—A man cooling fan that increases production is d scribed in circulars offered by Robinson Ventilating Co pany.

Lights—Where and when needed are described by T American Fixture Company.

Window Cleaners—a trial offer of two gallons of cleani fluid is made by the Ever-Glow Company.

—that clean safely and quickly are described by T Gerson Stewart Corp.

Spray Equipment—That saves three-quarters of your ins and outside painting costs. Mellish-Hayward Compa

Cleaning Material—Industrial Cleaning Materials and Me ods are described by The Oakite Products, Inc.

Water Tanks—An elevated tank that assures fire protecti Write for booklet. Chicago Bridge & Iron Works.

Brushes—course wire brushes for portable grinding machi for removing rust and scale from iron and steel. T Osborn Mfg. Co.

MATERIALS HANDLING

Overhead Carriers—An improved tee-bar system is illustrated by Reading Chain & Block Corp. featuring both hand and electric operated.

A Mono-Rail System is described in a new booklet just off the press, entitled "Materials Handling." The Louden Company.

that move any load from a few pounds to 3 tons—quickly and easily. Richards-Wilcox Mfg. Co.

Pickling Baskets—A corrosi pickling basket is manufactured by The

Conveyors—For eliminating handling wastes, reducing ti between operations, write for "Seven Economies Logan Conveyors." Logan Company.

Conveyors and track unloaders and their economies described in the booklet of The Chicago Automatic C veying Company.

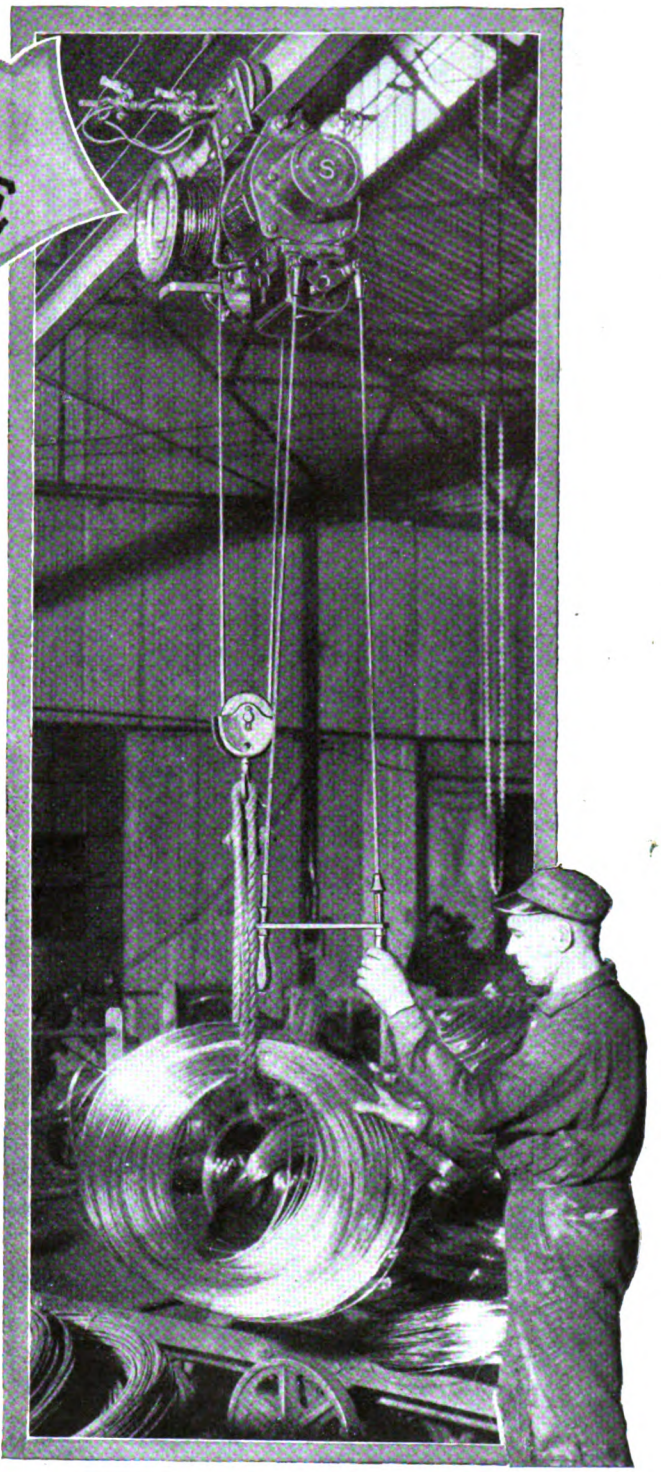
Lift Trucks—A new Plimptruck at a great reduction in pr C. A. Graham.

A lift truck designed to handle loads of any shape

(*Co...in..ed on pa,e* 102)

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Totally Enclosed Gears
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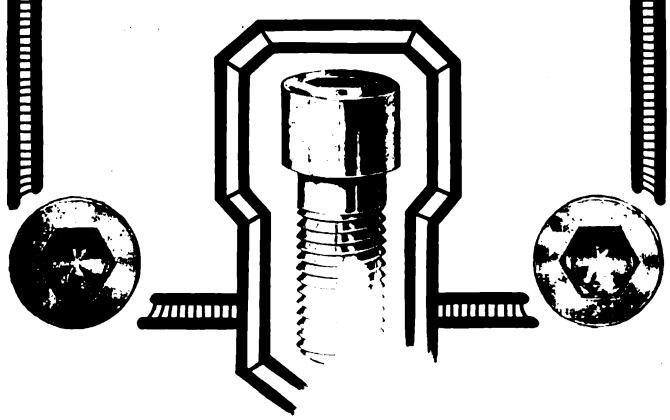
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W. J. McRae
320 Market Street
San Francisco, Cal.



(*Continued from page* 100)

size ordinarily found in the modern industrial plant Send for the booklet "Snapshots of Sensible Savings." The Lakewood Engineering Company.

Pressed Steel Equipment—A complete line or pressed stee material handling equipment is described by The Powel Pressed Steel Company.

Car Movers—A car mover with almost the strength of a switch engine. G. D. Rowell & Son.

That move heavily loaded cars are described by Th Appleton Car Mover Company.

A Car Mover that saves time in moving loaded and empt cars. The Advance Car Mover Company.

Scales—"Weigh While You Convey," described by The Mer rick Scale Mfg. Co.

For both weighing and sacking loose materials. Rich ardson Scale Company.

Casters—built to stand every possible use and abuse. Servic Caster & Truck Co.

Catalog F 104 describes a caster for the roughest, mo uneven floors. The Bassick Company.

Wire Rope—of uniform construction that gives maximu protection. Williamsport Wire Rope Company.

Electric Trucks—A description of the special motor design for The Baker-Raulang Co. Electric Truck.

Factory Trucks—A truck that hauls more and lasts longe Globe Vise & Truck Co.

Trailers—A well-built industrial trailer for industrial pu poses. Mercury Mfg. Co.

Truck Wheels—Canvas Cushion Truck Wheels that are positive protection to the finest floors. Divine Brothe Company.

Shovels—that will outlast six or more ordinary shovels. T Wood Shovel & Tool Co.

Electric Hoists—an electric hoist for every purpose. She ard Electric Crane & Hoist Company.

With steel plate suspension. Roeper Crane & Ho Works, Inc.

Coal Handling Systems—that have reduced labor costs much as 97%. Weller Mfg. Co.

Portable Cranes—A Small Portable Crane that is sent on days trial is described in Catalog IN. The Can Foundry & Machine Company. See page 118.

Conveying Chains—Chains for elevating and conveying m chinery. The Jeffrey Mfg. Co.

Chair Blocks—In various types and sizes for every purpo The Yale & Towne Mfg. Co.

Shipping Boxes—Corrugated Fibre Shipping Boxes and pa ing material. A free service offered. Hinde & Da Paper Company.

POWER PLANT EQUIPMENT AND AUXILIARIES

Regulators—A feed water regulator that puts boilers on efficient basis is described in a catalog of The Chap Fulton Mfg. Co.

Unions—A free trial offer is made by E. M. Dart Mfg. C

Heating Pumps—For the nearest pump engineer, Nash gineering Company.

Industrial Thermometers—A complete service by the E neering Staff is offered by The Industrial Divisio The Moto Meter Company, Inc.

(*Continued on page* 104)

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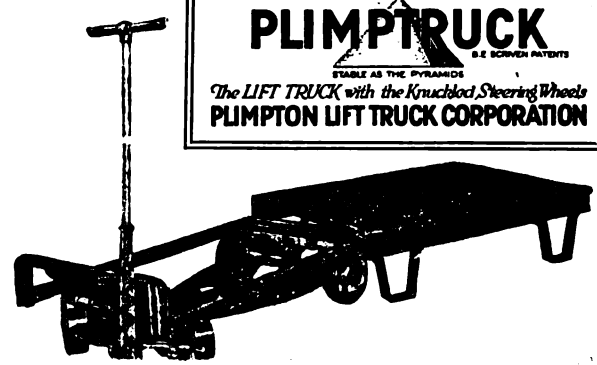
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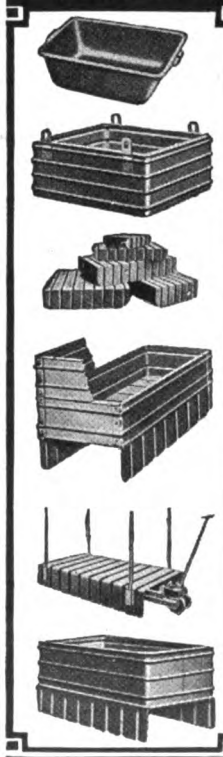
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(*Continued from page* 102)

Heat Insulation—that saves horsepower. Johns-Manville.

Steam Traps—Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving maximum heat from steam used. Write for Bulletin 133. Illinois Engineering Company.

Eliminating waste in the steam line. A "Sarco" is sent on 30 days free trial. Sarco Co., Inc.

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Surface Grinders—Particularly efficient on a wide variety of small tools. Full particulars may be had from the L[illegible] Salle Tool Company.

Drills—The six famous twist drills are described by T[illegible] Cleveland Twist Drill Company.

For high speed drills see The Standard Tool Co.

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Ladles—Bottom pour ladles that save time and metal a[illegible] assure safety. Rowell Manufacturing Company.

Wrenches—Reversible Ratchet Type are shown by T[illegible] Lowell Wrench Company.

—Of Chrome Vanadium Steel are described by Bonn[illegible] Forge & Tool Works.

Chain Wrenches—Trimo Chain Wrenches, made of b[illegible] selected bar steel, and sure grip jaws. Trimont Ma[illegible] facturing Co.

Saws—Metal cutting saws for severe service and accur[illegible] work. Simonds Saw and Steel Co.

Cut costs with a Parks shipping room saw. The Pa[illegible] Woodworking-Machine Company.

Saw Blades—Facilitate cutting with Victor Blades. See V[illegible] tor Saw Works.

Set Screws—a set screw that is guaranteed against breaka[illegible] The Allen Mfg. Co.

Screw Drivers—A one-piece forged screw driver that will [illegible] longer. The American Saw & Mfg. Co.

Filing, Grinding and Polishing Machines—A new deve[illegible] ment for the finishing of dies and similar work. N[illegible] Strand & Company.

Woodworking Machines—of speed, durability and accu[illegible] that lower operating costs are described by Gallm[illegible] & Livingston Company.

Taps—Taps which are noted for their exactness to size, [illegible] cutting qualities, etc. Morse Twist Drill & Mac[illegible] Company.

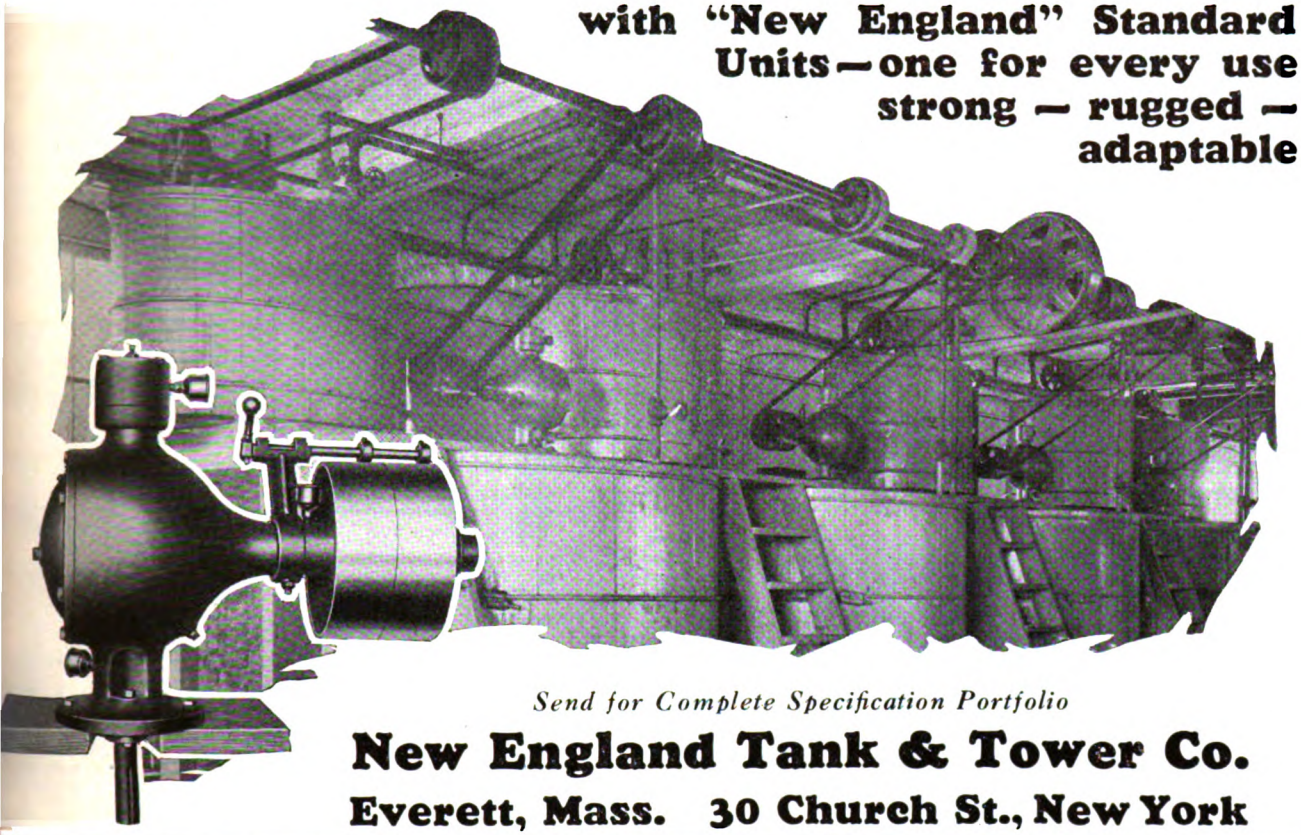
Micrometers—of split hair accuracy are described by Br[illegible] & Sharpe Mfg. Co.

(*Continued on page* 106)

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Steady — dependable agitation

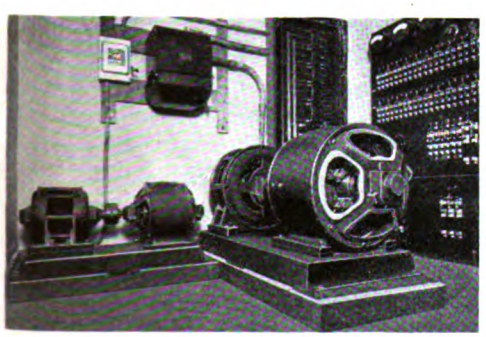
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DIEHL MOTOR GENERATOR SETS

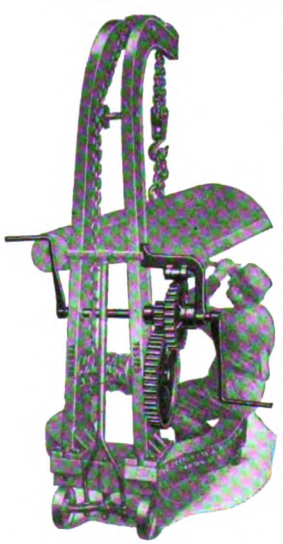
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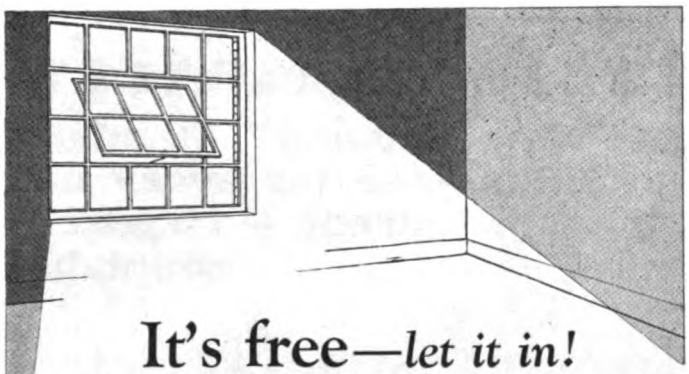
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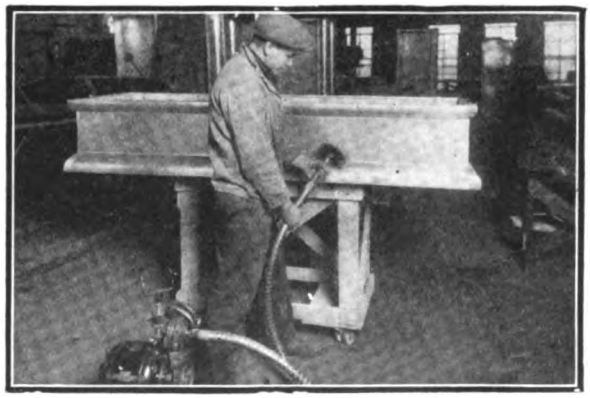
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(Continued from page 104)

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A ball bearing force-feed lubricated speed reducer t has an efficiency of over 96%. Reeves Pulley Compa

With Timken tapered roller bearings. Send for the sp reducer bulletin. R. D. Nuttall Company.

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Colored Pencils—for making fine lines. American Lead cil Company.

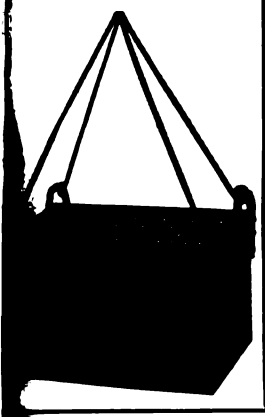
Counters—A full line of magnetic and mechanical cou for all machines is offered by The Veeder Mfg. Co

Measuring Instruments—Instruments that carry the gu tee of seventy-odd year of manufacture are describ Taylor Instrument Companies.

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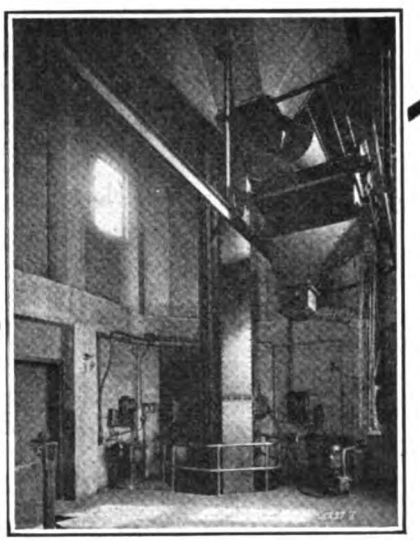
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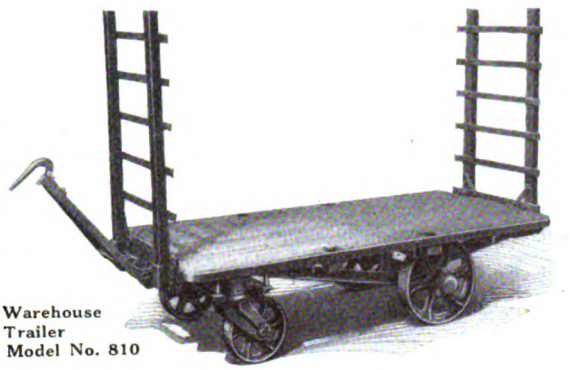
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MERRICK SCALE MFG. CO.
180 Autumn St. Passaic, N. J.



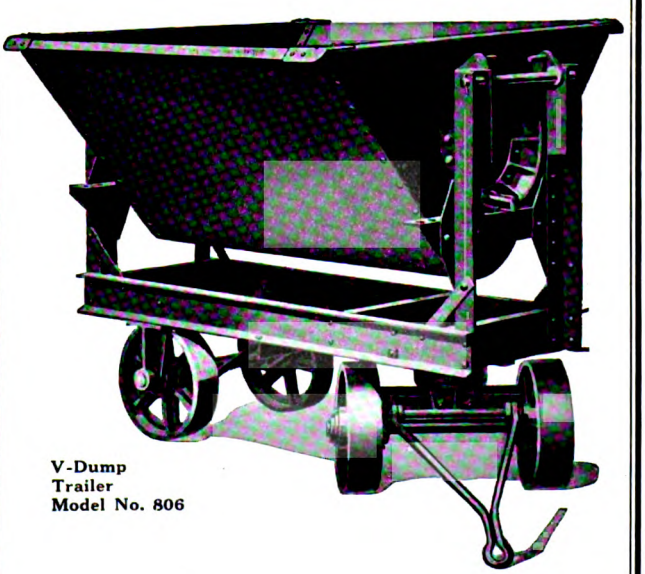
Warehouse
Trailer
Model No. 810

The Difference

The difference between Lakewood Trailers and ordinary trailers is not always apparent at first glance, but compared part for part and dimension for dimension the practiced eye sees superiorities of design and workmanship that can only be the result of a thorough understanding of trailer uses and industrial needs.

Lakewood manufactures a complete line to meet every factory requirement. Standard sizes are carried in stock ready for immediate shipment.

The
Lakewood Engineering Company
Cleveland, O.



V-Dump
Trailer
Model No. 806

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(Div. of Shepard Elec. Crane & Hoist
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Strand & Co., N. A. .....

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Triumph Electric Corp. .....
Twin Disc Clutch Co. .....

U

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U. S. Gutta Percha Paint Co. .....

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Veeder Mfg. Co. .....
Victor Saw Works, Inc. .....
Vortex Mfg. Co. .....

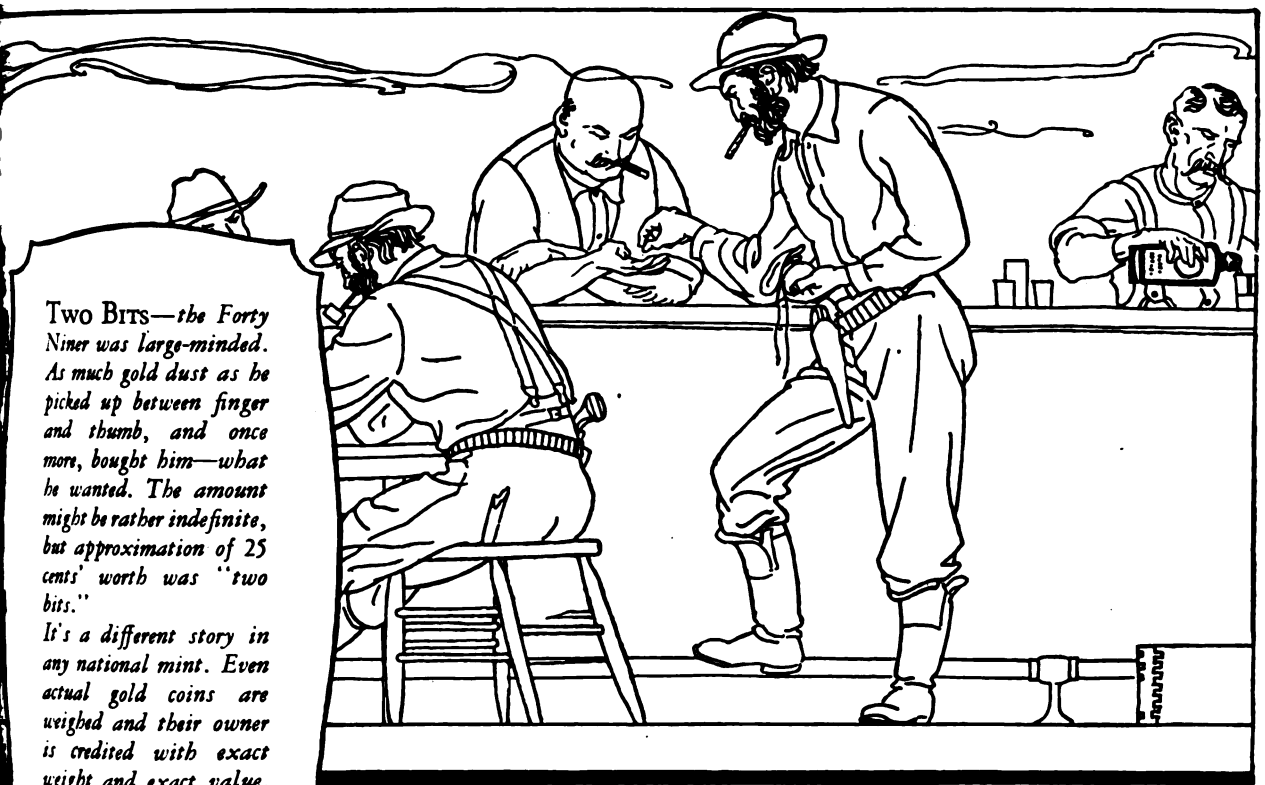
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Wisconsin Electric Co. .....
Wood Shovel & Tool Co. .....
Wood's Sons Co., T. B. .....

Y

Yale & Towne Mfg. Co. .....

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TWO BITS—*the Forty Niner was large-minded. As much gold dust as he picked up between finger and thumb, and once more, bought him—what he wanted. The amount might be rather indefinite, but approximation of 25 cents' worth was "two bits."*

It's a different story in any national mint. Even actual gold coins are weighed and their owner is credited with exact weight and exact value.

The basis of successful manufacture is FACTS

The old colored mammy might produce wonderful table delicacies by luck and guess, but the laboratories of modern business can only operate on facts.

Scientific instruments for indicating, measuring and controlling temperature must be accurate or they are worthless and can cause heavy money loss. No less essential is such accuracy in the home or hospital, on boat, train or airplane, when human life is at stake.

Tycos Instruments are used wherever it is necessary for man to measure, record or control temperature. And how they can be depended on for *facts* is indicated by the fact that men of medicine, science and industry today practically universally demand *Tycos*.



Taylor Instrument Companies

ROCHESTER, N. Y., U. S. A.

CANADIAN PLANT
TYCOS BUILDING, TORONTO

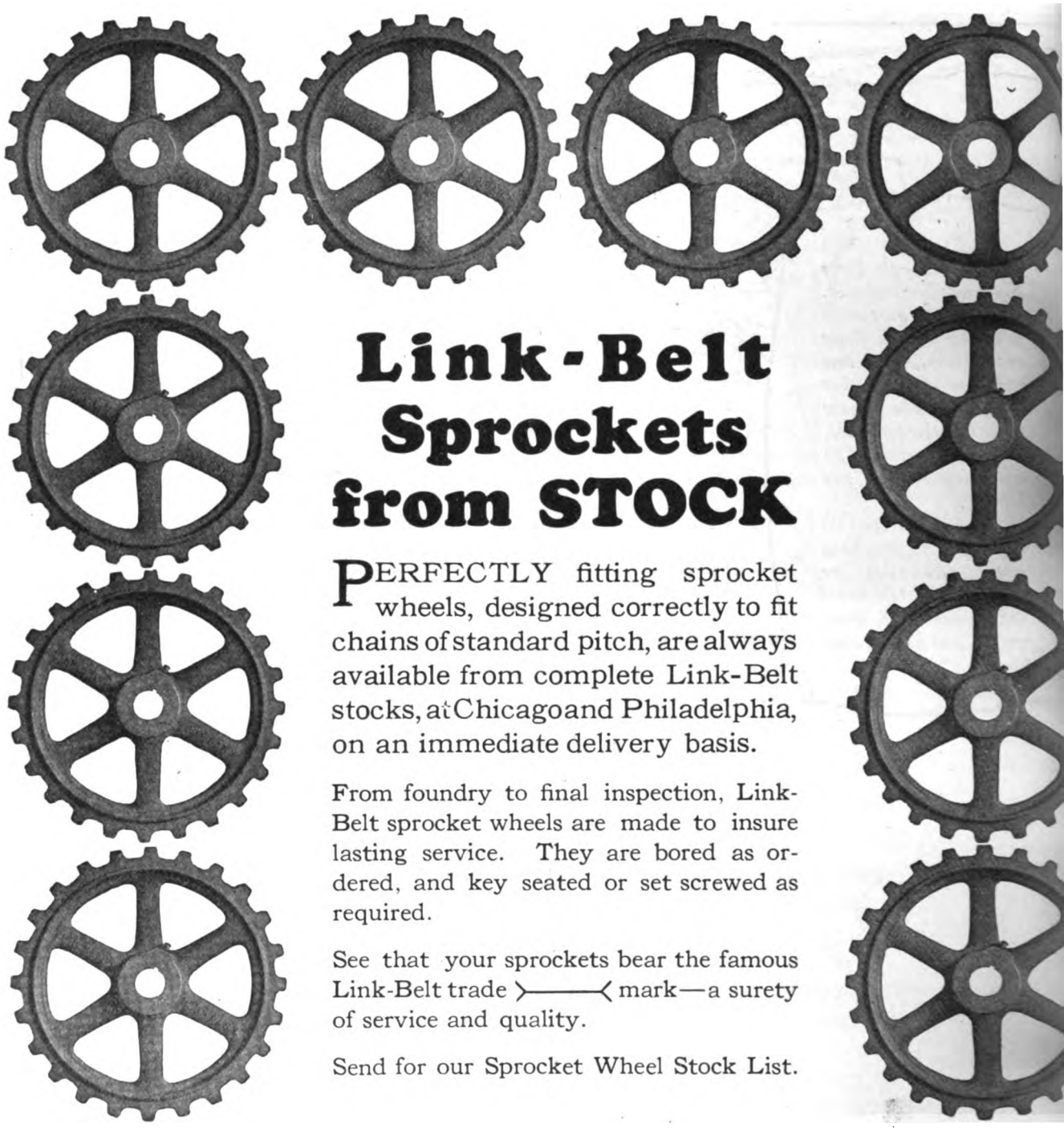
MANUFACTURING DISTRIBUTORS IN GREAT BRITAIN, SHORT & MASON, LTD., LONDON

THE SIXTH SENSE OF INDUSTRY

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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Link-Belt Sprockets from STOCK

PERFECTLY fitting sprocket wheels, designed correctly to fit chains of standard pitch, are always available from complete Link-Belt stocks, at Chicago and Philadelphia, on an immediate delivery basis.

From foundry to final inspection, Link-Belt sprocket wheels are made to insure lasting service. They are bored as ordered, and key seated or set screwed as required.

See that your sprockets bear the famous Link-Belt trade mark—a surety of service and quality.

Send for our Sprocket Wheel Stock List.

LINK-BELT COMPANY

Leading Manufacturers of Elevating, Conveying, and Power Transmission Chains and Machinery

CHICAGO, 300 W. Pershing Road

Ashland, Ky. . . . . .
V. P. Dalmas & Co., 100 W. Winchester Ave.
Atlanta . . . . 511 Haas-Howell Bldg.
Birmingham, Ala. . . .229 Brown-Marx Bldg.
Boston . . . . . 1103-4 Statler Bldg.
Buffalo . . . . . 554 Ellicott Square
Cleveland . . . . . 527 Rockefeller Bldg.
Denver . . . . . 520 Boston Bldg.
Detroit . . . . . 5938 Lindsdale Ave.
Huntington, W. Va., Robson-Prichard Bldg.

INDIANAPOLIS, 200 S. Belmont Ave.

Kansas City, Mo., R. 436, 1002 Baltimore Ave.
Louisville, Ky. . . . 349 Starks Bldg.
Minneapolis, Minn. . . . . .
Link Belt Supply Co., 418 S. Third St.
New Orleans, 504 New Orleans Bank Bldg.

PHILADELPHIA, 2045 Hunting Pa

New York . . . . 2676 Woolwo
Pittsburgh . . . . . 333 F
St. Louis 3635
Wilkes-Barre, 836 Second National Ba

H. W. CALDWELL & SON CO.:—Chicago, Western Ave., 17th and 18th Sts.; Dallas, Texas, 1221 Mercantile Bank Bldg.; New York, 2676 Woolworth Bldg.
LINK-BELT MEESE & GOTTFRIED CO.:—San Francisco, 19th and Harrison Sts.; Los Angeles, 361-369 S. Anderson St.; Seattle, 820 First Ave., S. Portland, Ore., 67 Front St.; Oakland, Calif., 526 Third St.
In Canada—LINK-BELT LIMITED—Toronto and Montreal.

LINK-BELT SPROCKETS

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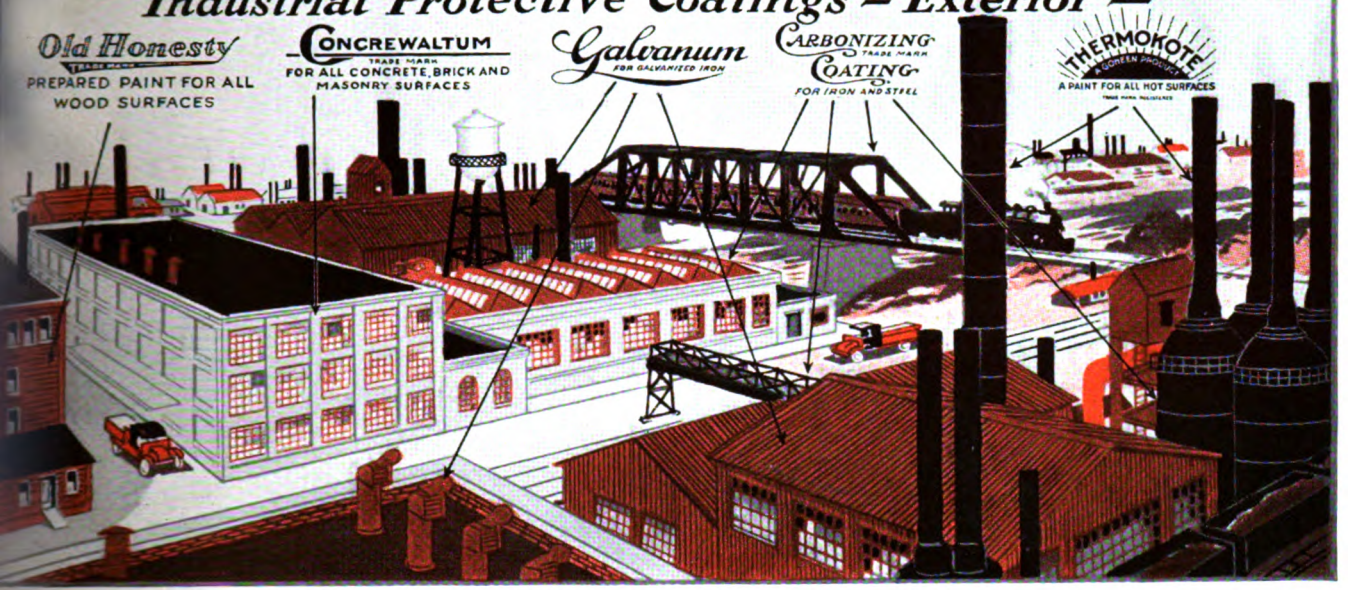
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The Worlds Annual Loss from Rust and Rot Runs into Millions
Prevent this Loss with —

GOHEEN

SINCE 1888 SINCE 1888

Industrial Protective Coatings – Exterior —



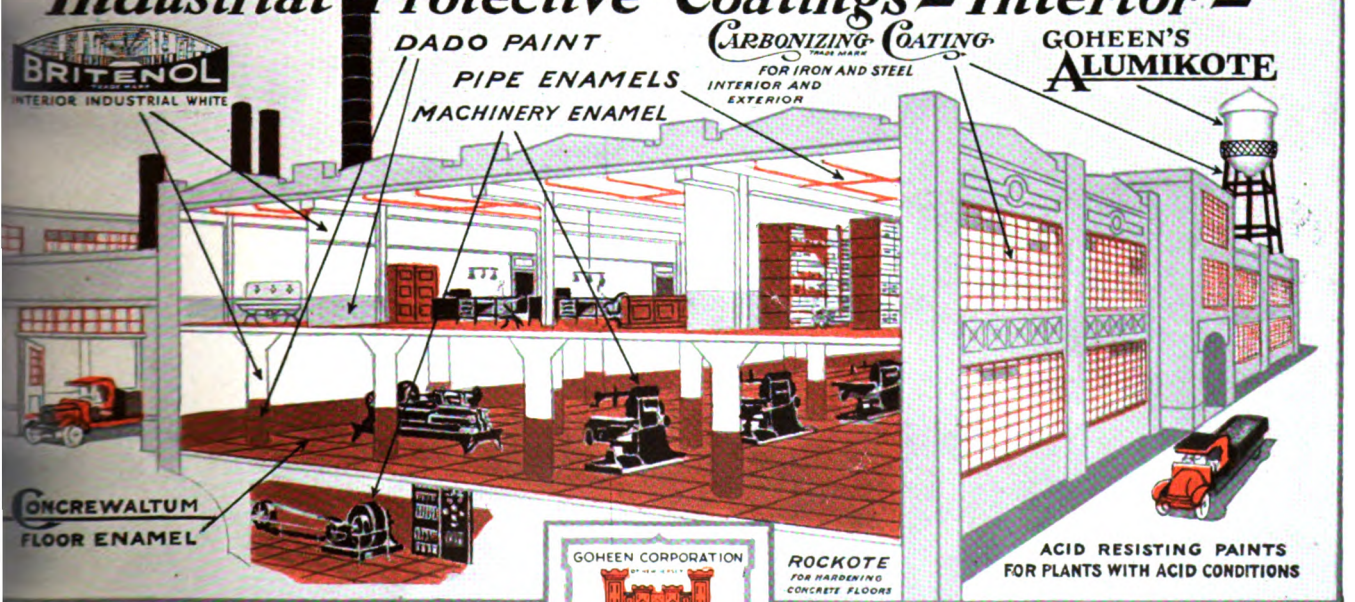
There is a GOHEEN Paint for Every Industrial Requirement

Increase Plant Efficiency and Economy with

GOHEEN

SINCE 1888

Industrial Protective Coatings – Interior —



GOHEEN CORPORATION
OF NEW JERSEY
NEWARK, N. J.

Paint Engineers to Large Industrials, Public Utilities and Railroads Since 1888

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EILERT PRINTING COMPANY



of Mechanical Achievement

electric cranes and hoists occupy a position of outstanding importance. Reduced costs and increased production in many industries are attributed to this means of lifting and moving loads.

And thousands of these units in service today have gone out from Montour Falls, N. Y., for many years a community of engineers and machinists, builders of electric cranes and hoists.

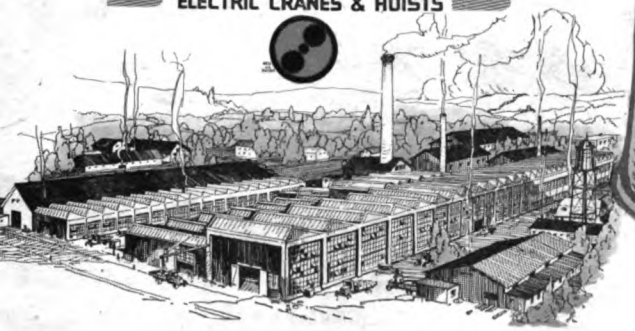
It is here that James A. Shepard produced his first electric hoist a quarter century ago. It is here that Shepard Electric Cranes and Hoists are still built.

From a modest beginning, the Shepard Company has grown to be the largest manufacturer of electric hoists in America—supplying practically every branch of industry with both electric cranes and hoists.

The Shepard line is so complete that a crane or hoist precisely suited to every condition can be furnished. Shepard engineers with the experience of many thousand installations are at your service.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities
Largest Manufacturer of Electric Hoists in America

SHEPARD
ELECTRIC CRANES & HOISTS



INDUSTRY	SHEPARD UNITS
Automotive	1018
Boiler	383
Bolt, Nut and Screw	78
Brass, Copper, Aluminum	618
Car Builders	1200
Cement	97
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SHEPARD FLOOR-OPERATED ELECTRIC HOIST



SHEPARD ELECTRIC TRAVELING CRANE



SHEPARD CAGE-OPERATED ELECTRIC HOIST

To Cut Lifting *and* Load-moving Costs of American Industry

that is Shepard's mission. It represents a service that has found its way into practically every branch of manufacturing and distribution.

The classification, listing some of the important industries using Shepard equipment, is indicative of the diversified application of these Electric Cranes and Hoists:

INDUSTRY	SHEPARD UNITS
Lumber and Furniture	516
Machine Shops (as part of another industry)	293
Machine Tool	269
Paint, Lead, Oil	137
Paper and Fibre	380
Printing Plants	138
Railroads	391
Rubber	130
Smelting and Refining	417
Sheet and Plate	161

INDUSTRY	SHEPARD UNITS
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Stone, Slate, Brick and Marble	170
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Wire and Fence	435

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25 Cents

Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

Features in This Issue

How Can I Finance New Plant and Equipment?

The Place of the Builder's Second Mortgage—What the Manufacturer Must Have to Qualify for a Loan

Balance and Control Production to Meet Seasonal Requirements

How the Foundry Schedule Dominates and How It Must Be Maintained to Eliminate Unfinished Orders

Reclaiming Valuable Material from Factory Waste

Magnetic Separators Applied to Conveyors Recover Material Otherwise Hard to Sort Out

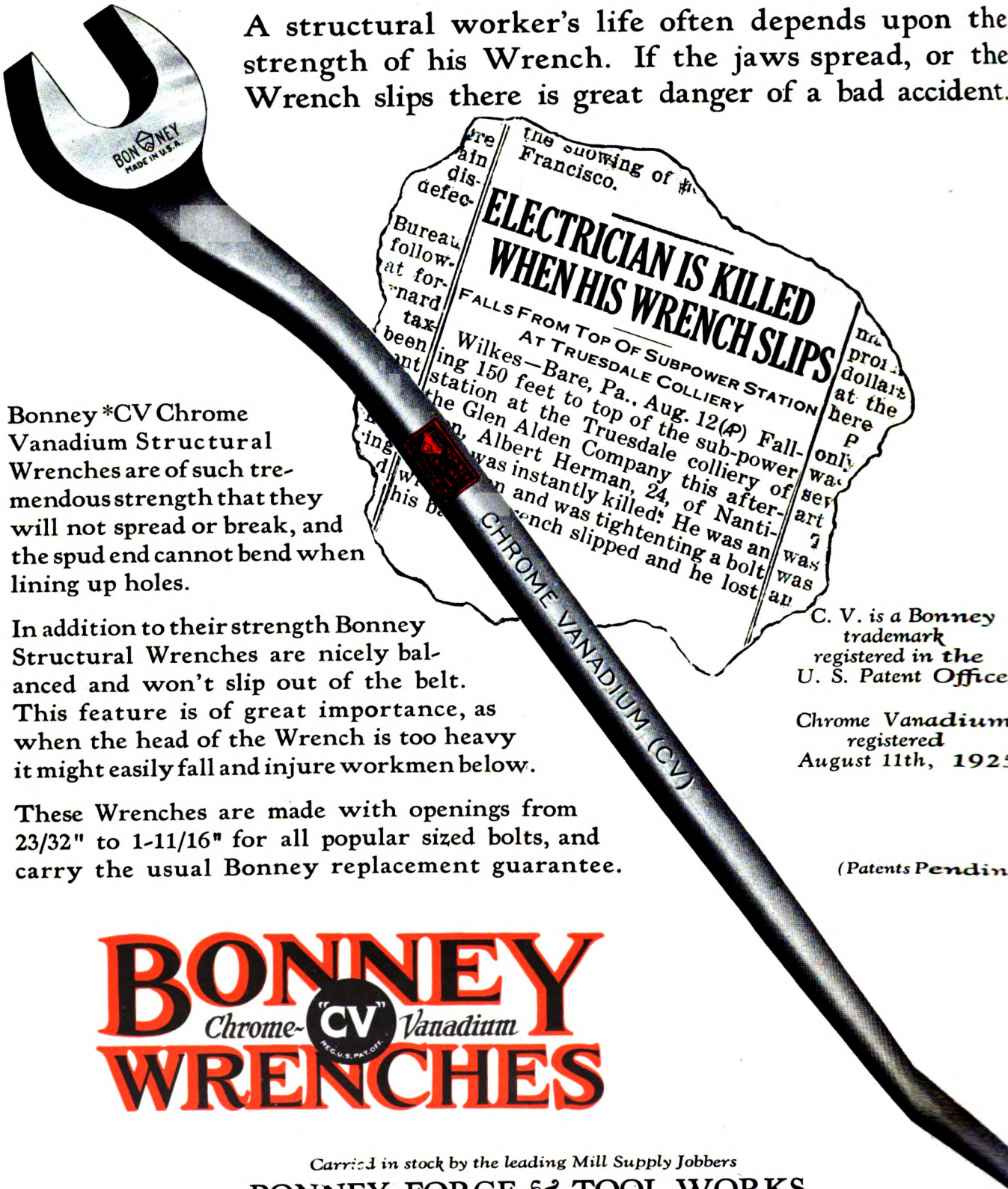
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BONNEY *C.V. Chrome Vanadium
STRUCTURAL WRENCHES

A structural worker's life often depends upon the strength of his Wrench. If the jaws spread, or the Wrench slips there is great danger of a bad accident.



Bonney *CV Chrome Vanadium Structural Wrenches are of such tremendous strength that they will not spread or break, and the spud end cannot bend when lining up holes.

In addition to their strength Bonney Structural Wrenches are nicely balanced and won't slip out of the belt. This feature is of great importance, as when the head of the Wrench is too heavy it might easily fall and injure workmen below.

These Wrenches are made with openings from 23/32" to 1-11/16" for all popular sized bolts, and carry the usual Bonney replacement guarantee.

C. V. is a Bonney trademark registered in the U. S. Patent Office

Chrome Vanadium registered August 11th, 192

(Patents Pendin

BONNEY Chrome-"CV" Vanadium WRENCHES

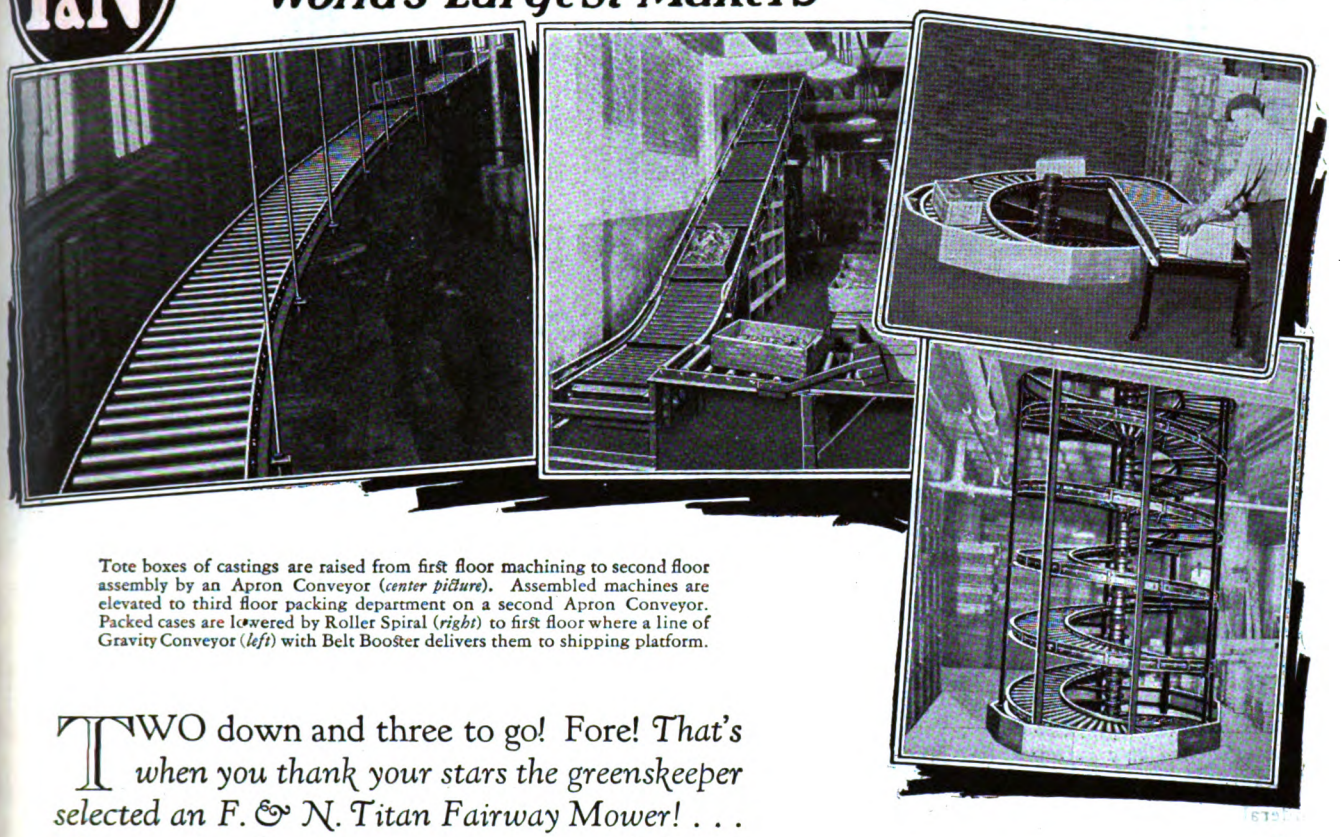
Carried in stock by the leading Mill Supply Jobbers

BONNEY FORGE & TOOL WORKS
ALLENTOWN, PA.

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F&N LAWN MOWERS—another user

World's Largest Makers



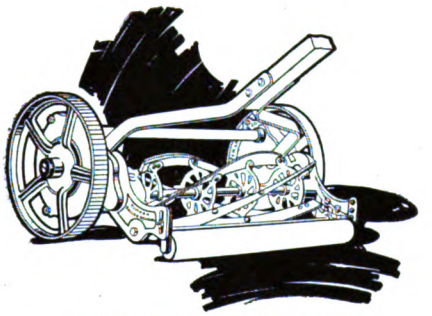
Tote boxes of castings are raised from first floor machining to second floor assembly by an Apron Conveyor (*center picture*). Assembled machines are elevated to third floor packing department on a second Apron Conveyor. Packed cases are lowered by Roller Spiral (*right*) to first floor where a line of Gravity Conveyor (*left*) with Belt Booster delivers them to shipping platform.

TWO down and three to go! Fore! *That's when you thank your stars the greenskeeper selected an F. & N. Titan Fairway Mower!* . . . Thousands of golf courses, parks and lawns are kept smooth by F. & N. Lawn Mowers. And the production of F. & N. Mowers is kept smooth and economical by the use of Logan Conveyors . . . . Whether your problem is one of cutting grass or cutting costs, you can doubtless benefit by the experience of the F. & N. Lawn Mower Co., world's largest makers of lawn mowers. Write today for your copy of *"Seven Economies of Logan Conveyors"*—it will not obligate you.

Logan Co.
INCORPORATED 1865
(Formerly THE DOW CO.)

504 N. Buchanan St. LOUISVILLE, KY.

Offices in Principal Cities



A LAWN MOWER with self-adjusting Timken bearings and the same accurate machining that goes into fine automobile parts. That's the F. & N.! Exclusive features have much to do with the success of both F. & N. Lawn Mowers and of Logan Conveyors, but back of each is an even greater advantage—half a century of practical manufacturing experience.

Logan Conveyors
LOUISVILLE

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Have You Made These Three Burmaline BELTING Toughness Tests?

TOUGHNESS, with the desired pliability, is a prime requisite of long-lived, economical power transmission belting and these three tests will definitely establish TOUGHNESS as an outstanding quality of BURMALINE BELTING.

DRAW KNIFE TEST: Take a sharp knife and try to cut a piece of BURMALINE with or against the length of the belt. Make similar tests with other belting. The sharp contrast will prove the toughness of the materials used.



Draw Knife Test

WHITTLE TEST: Try to whittle a piece of BURMALINE BELTING. The tough, homogeneous structure will demand a sharp knife and considerable strength. You will note there is no cheese-like cut but a marked contrast to other types of belting you are using.



The Whittle Test

RIPPING TEST: Split a piece of BURMALINE BELTING part way down. Take a firm grip on the two sections and attempt to rip it the rest of the way. If you do it you will be forced to call into play the combined arm and back muscles. Contrast this test with a similar test on other belts.



Ripping Test

Analyze these tests and you will see they are practical tests PROVING THAT BURMALINE IS A TOUGH BELT.

Complete, Helpful Information Is Contained in a Booklet, "How, When and Where to Use Burmaline Belting." Write for It and for Testing Samples. Ask Your Jobber to Tell You More.

BURRELL BELTING COMPANY

Manufacturers of Burmaline Belting—Alfalfa Belting—Ebony Transmission and Conveyor Belting—Universal Belt Oil and E-Z Grip Transmission Lining for Ford Cars and Trucks

416 South Hermitage Ave., CHICAGO, ILL.



Preparedness

THE weather conditions, during the Summer months, are ideal for painting, roofing and other maintenance requirements of industrial plant buildings.

But it is also a good time to make a thorough inspection of all plant equipment—transmission, power, materials handling, production, etc. See that every machine is fully efficient to handle the increased demands of Fall and Winter. Selection becomes easy by turning to the "Where to Purchase" Section on page 94. Here the latest and most modern equipment and machinery and supplies are listed—items that will bring greater efficiency and lower costs in every department of your business.

Harvey Conover, Jr.
Business Manager.

Industry Illustrated

Published Monthly by

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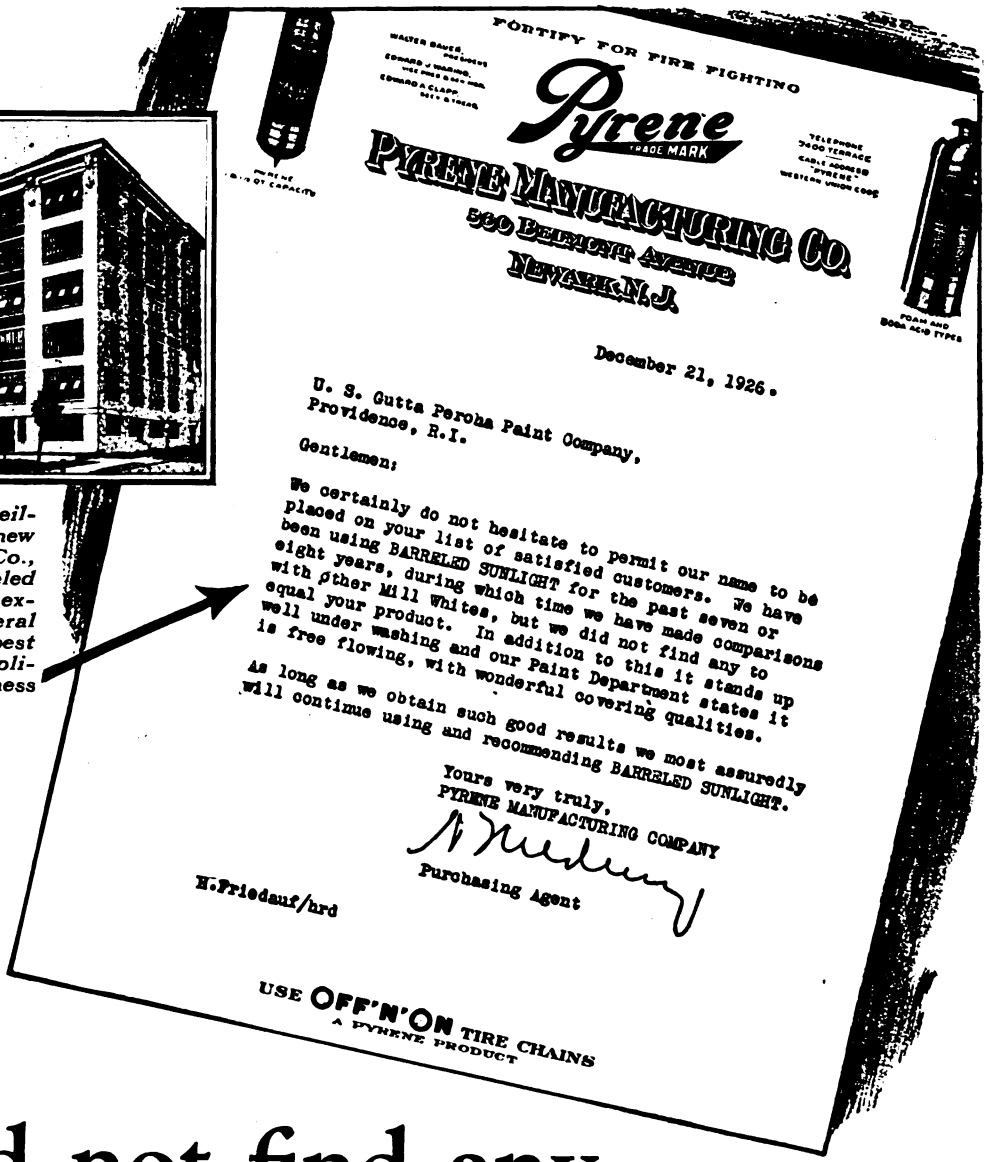
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When it came to painting ceilings and walls in this fine new plant of the Pyrene Mfg. Co., Inc., at Newark, N. J., Barreled Sunlight was chosen because experience over a period of several years had proved this paint best in covering power, ease of application, and lasting cleanliness



FORTIFY FOR FIRE FIGHTING

Pyrene TRADE MARK

PYRENE MANUFACTURING CO.
560 BELMONT AVENUE
NEWARK, N.J.

December 21, 1926.

U. S. Gutta Percha Paint Company,
Providence, R.I.

Gentlemen:

We certainly do not hesitate to permit our name to be placed on your list of satisfied customers. We have been using BARRELED SUNLIGHT for the past seven or eight years, during which time we have made comparisons with other Mill Whites, but we did not find any to equal your product. In addition to this it stands up well under washing and our Paint Department states it is free flowing, with wonderful covering qualities.

As long as we obtain such good results we most assuredly will continue using and recommending BARRELED SUNLIGHT.

Yours very truly,
PYRENE MANUFACTURING COMPANY

Purchasing Agent

H.Friedauf/hrd

USE OFF'N'ON TIRE CHAINS
A PYRENE PRODUCT

"We did not find any to equal your product"

THE Pyrene Company's satisfaction with Barreled Sunlight for painting ceilings and walls is shared by leading plants in almost every industry today.

Not only does this dirt-resisting, washable white paint insure a longer period of cleanliness and adequate light-reflection without repainting, but it also *costs less to apply* than other gloss paints. Quantity for quantity, Barreled Sunlight covers a larger area, and it flows on so freely with brush or spray that many labor-hours are saved.

Guaranteed to remain white longest.

Sold in large churn-equipped steel drums and in cans. Where more than one coat is required, use Barreled Sunlight Undercoat first. See coupon.

U. S. Gutta Percha Paint Co., 5 Dudley Street, Providence, R. I. New York—420 Lexington Ave. Chicago—659 Washington Blvd. San Francisco—156 Eddy Street. Distributors in all principal cities.

Barreled Sunlight
Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

Please send us your booklet "More Light," and a panel painted with Barreled Sunlight.

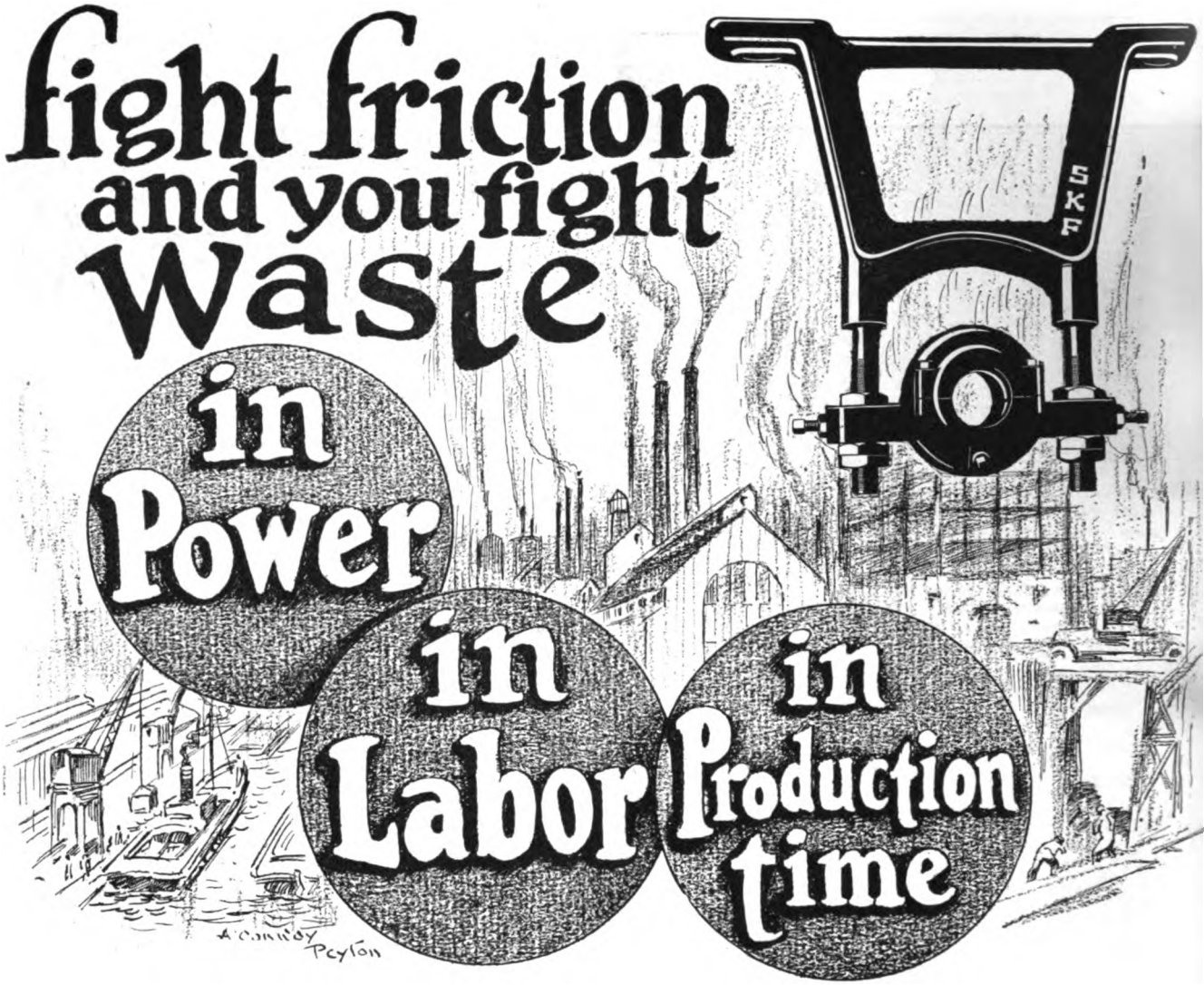
Name.....

Street.....

City.....*State*.....

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fight friction and you fight Waste in Power in Labor in Production time



IN the grinding department of an Indiana tool manufacturing plant,* overheated plain bearings caused hours of loss in production time. THAT was *before* Skayef Ball Bearing Hanger Equipment was installed.

In a North Carolina cotton mill,* oil drippings from plain bearings on line shafts ruined cases of valuable merchandise. THAT was *before* SKF-marked Bearings were installed.

In a Chicago steel stamping mill,* plain bearings demanded constant care and had to be oiled *twice* a day. THAT was *before* Skayef Equipment replaced the old bearings on line shaftings.

Friction, through plain bearings, stole 21% of the power in the Brooklyn plant of a large manufacturer of radio equipment.* THAT, too, was *before* Skayef Ball Bearings were installed on all line shafting throughout the shop.

No wonder manufacturers all over the country are fighting friction — fighting waste in production time, power, labor, lubricant — by installing SKF-marked Self-Aligning Hanger Equipment. Put *your* problems up to SKF.

*A Skayef Certified Survey, giving full details and actual figures of the savings in these plants will be forwarded you on request. Write for it—on your letter-head.

SKF

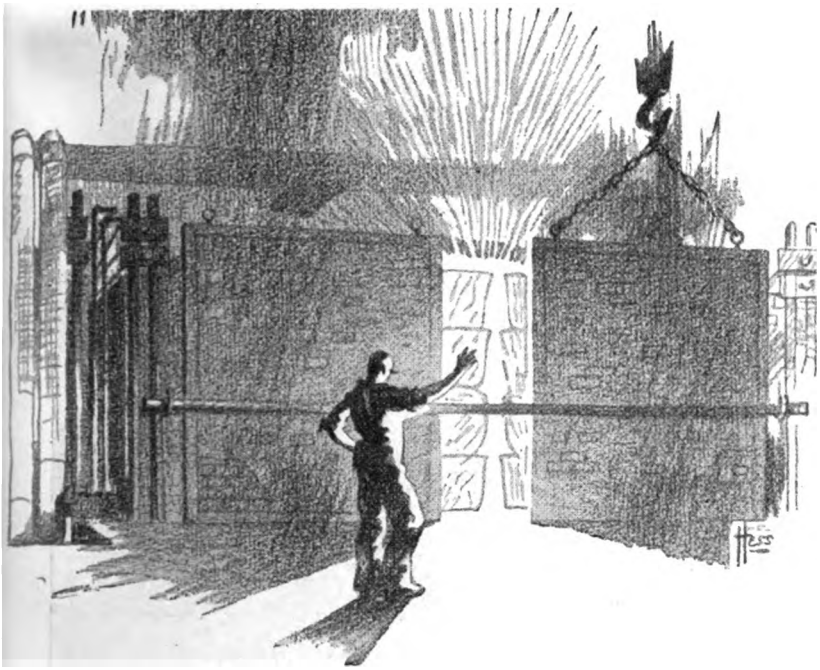
MARKED

Self-Aligning HANGERS *Ball Bearing*

SKF INDUS[TRIAL] C. — S. E. cor. Madison Ave. at 34th St. — NEW YORK CI

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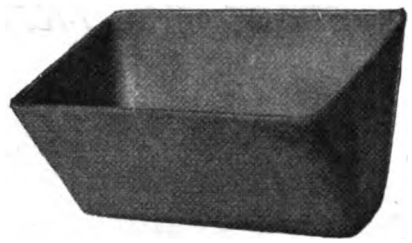
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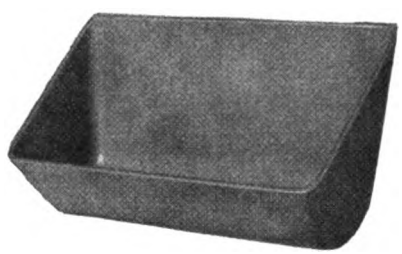
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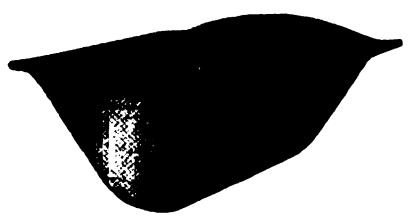
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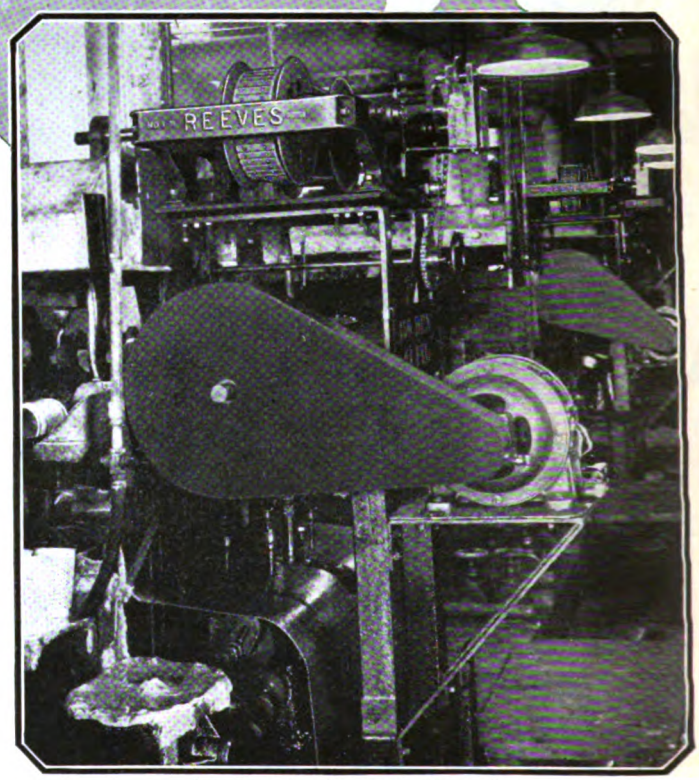
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For Active Executives, Engineers, Superintendents and Managers

In Mills, Shops & Factories

JOHN R. DUNLAP and MORGAN G. FARRELL *Editors*

W. THOMSON LEES *Associate Editor* — ADOLF SCHILDKRAUT *Art Director*

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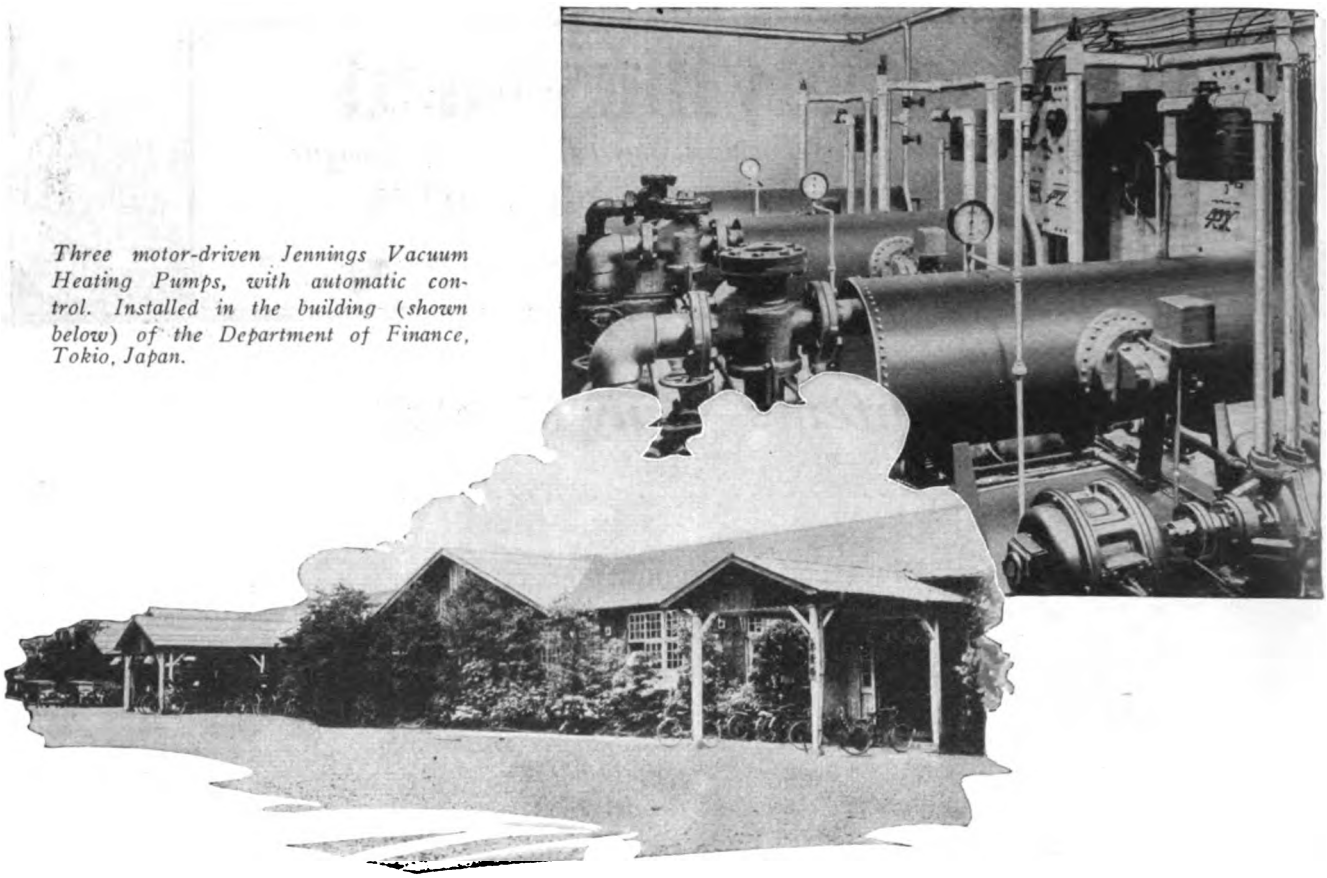
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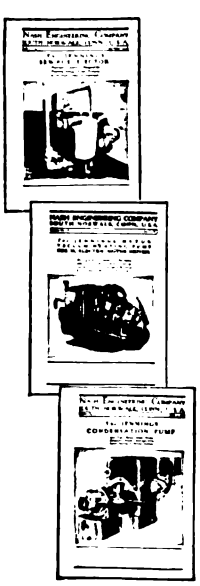
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An Editorial Announcement

By John R. Dunlap, Editor in Chief

IT affords me very genuine pleasure to announce that with this issue Mr. Morgan G. Farrell becomes the active Editor of INDUSTRY ILLUSTRATED.

This is, in fact, such an accession to the ranks of those of us who have a genuine and abiding interest in the work of developing a true Science of Management, that I am prompted to felicitate our readers over the prospect which the engagement holds out. For in addition to being a writer of rare talent, Mr. Farrell has had eighteen years of varied and practical experience as a professional mechanical engineer, specializing in the field of industrial and management engineering.

Mr. Farrell was born in New York and received his early education in private schools in this city. In 1901 he matriculated at the Stevens Preparatory School, Hoboken, N. J., and, the following year, entered Stevens Institute. At that time, Dr. Alexander C. Humphreys, who has recently retired from the Presidency of the Institute, after a distinguished career as an engineer and educator, had just assumed the duties of that office. On the faculty were such leaders of engineering thought as Drs. David S. Jacobus, James E. Denton, William H. Bristol, Albert F. Ganz and J. B. Webb. All of them were not only practising engineers but pioneers in technical education, as well.

Under their guidance, Mr. Farrell and those of his fellow-students who survived the rigors of an exacting course of study, built a solid foundation of scientific knowledge for future engineering work of almost any nature.

He delivered the Salutatory Address at the graduation exercises of his class in 1906, receiving the degree of Mechanical Engineer.

Early Engineering Experience

Having been offered a position in the office of the Chief Engineer of the Cambria Steel Company at Johnstown, Pa., he began work immediately. The three great steel mills of the Cambria Company offered a variety of experience in mechanical and electrical engineering, hydraulics, heat-treatment, mining and materials handling to be found in few other industries.

The electric drive for rolling mills was being developed and much of Mr. Farrell's work was the accumulation through tests, of the "power-to-roll" data necessary for the design of the huge, slow-speed motors to operate the mills. In addition, it was his duty to test and supervise the operation of the mechanical equipment, as boilers, engines, compressors, pumps and blowers, with a view to increased efficiency.

Family affairs requiring his presence nearer home, he returned to New York and, for some years, was associated with his father in building construction.

In 1911, he joined the Ransome Concrete Machinery Company, as mechanical engineer. Here he was privileged to assist in the rapid development of concrete mixing and spouting apparatus including the new compressed-air mixers, under the direction of Mr. Ernest L. Ransome.

Two years later, a casual meeting with another engineer, Mr. Willard L. Case, brought him the opportunity of entering the field of industrial engineering in which he finally came into his own. Mr. Case was then Chief Engineer of the Suffern Engineering Corporation, which maintained offices and a staff of industrial engineers in the principal cities in the United States and in Europe.

He assigned Mr. Farrell to the mills of the Salt's Textile Mfg. Company at Bridgeport, to prepare the layouts for extensive plant rearrangements which were subsequently carried out. Before the work was completed, Mr. Farrell was ordered to Dallas, Texas, to complete the plans and specifications and supervise the construction of an entirely new plant for the Continental Gin Company, manufacturers of cotton gins.

It was a difficult task since the new plant must be built in sections as the old one was demolished—without interference with manufacture.

It was successfully completed in 1914; and Mr. Farrell joined Mr. Case as a partner in the firm of Willard Case & Company. There he remained until America's entry into the World War. During this period, he was in charge of the planning and equipment of many new plants, power-houses and mill buildings, as well as of investigations and reports on plant projects. Among others were the factories of the Duratex Company (now a Willys-Overland unit), the Seneca Falls Mfg. Company, the Griswold Worsted Company, the Knox Hat Company and the Crofut and Knapp Company.

Service in France with the A. E. F.

Mr. Farrell had applied for a commission in the Engineer Corps of the U. S. Army before the declaration of a state of war and received it shortly after the

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epochal event. Within a few days after the close of the training camp period, he was temporarily attached to the 307th Engineers of the 82nd Division. Shortly thereafter, he was assigned to the 24th Engineers-Army troops, whose function was to operate field-shops and shop-truck trains. He arrived in France, with the regiment, in March, 1917; and was immediately ordered to start building the Engineer Shops at Gièvres and to put them in operation at once. For this work, he was recommended for the Distinguished Service Medal.

After the organization of the Second Army under General R. L. Bullard, Mr. Farrell was transferred to the staff of General Herbert Deakyne, Chief Engineer. There he was appointed Personnel Adjutant and later Army Shop Officer and Army Water Supply Officer. He continued to direct the operation of the advanced and truck shops until April, 1918, when he was ordered to Paris headquarters to assist in the disposition of the engineering material in all the depots in France. After demobilization, he remained in the Reserve Corps for some years, with the rank of Major.

The following letters from his commanding officers indicate the character and efficiency with which Mr. Farrell handled his duties for the U. S. Army:

Letters from General Bullard and Colonel Bell

Headquarters Second Army
American Expeditionary Forces
Office of Commanding General

8 April, 1919.

From: Commanding General, Second Army,
To: Captain Morgan G. Farrell, Engineers,
Subject: Services at Second Army Headquarters.

1. As your duties at these headquarters are about to be terminated on account of the discontinuance of the Second Army, I wish to express my appreciation of the work you have done.

2. Your services in the Supply Department of the office of the Chief Engineer have been valuable and important and have contributed largely to the operation of that office.

3. I desire to thank you for your service with this Army.

(Signed) R. L. Bullard,
Lieutenant General, U. S. A.

American Expeditionary Forces
Services of Supply
Office of the Chief Engineer, A. E. F.
A. P. O. 702.

August 30, 1919.

From: Colonel J. F. Bell, Corps of Engineers, A. P. O. 702.
To: Captain M. G. Farrell, Engineers.
Subject: Commendation.

1. I wish to express to you my appreciation of the efficient and conscientious work which you have done during your eighteen months service with the A. E. F. You have received the emphatic commendation of each officer under whom you have served, have been promoted in grade and recommended for the award of the Distinguished Service Medal.

2. You have had a great variety of work, including the charge of the construction, layout, and operation of shops, charge of Depot work, charge of Army water supply, and the disposal of stock under the direction of the Sales Agent. Few officers have a better r

J. F. Bell,
C ngineers, U. S. A.

Shortly after his return to the United States, M Farrell and his partner decided to accept an offer fro Miller, Franklin, Bassett and Company (industrial e gineers), to purchase the business of Willard Case Company. Mr. Case became treasurer of the Yale Towne Mfg. Company and Mr. Farrell took charge the newly organized division of Miller, Franklin, Ba sett & Company.

Recent Professional Engineering Work

His activities during the next few years parallel those of the pre-war period, namely, investigations, pla ning and valuations. Among the plants in which was engaged were those of the Russell Mfg. Compan Ritter Dental Mfg. Company, Diamond Match Co pany and the Durfee, Parker, Hargraves, Bourne, Cha and Barnard Mills.

During this period, also, Mr. Farrell had begun write articles of a semi-technical nature for the gineering and general publications, the demand which became great enough to warrant his devoti more time to the literary expression of his ideas a experience.

The opportunity of assisting in the establishment a magazine devoted to Building Investment and Main nance (and called by that name) brought with it enlargement of his field of creative writing. His c tributions have appeared in the columns of Industri Management, Industry Illustrated, the "Satur Evening Post," "Forbes," "Factory," "System" a some thirty other publications.

In the light of this record of varied professional a editorial experience, it is evident that Mr. Farrell had precisely the training needed to fit him for tell work in our highly specialized field of applied scie My belief is that he will promptly prove himself one the foremost and most effective writers in our new, now rapidly expanding, field of technical literature, hence I look forward to the association with most ple ing anticipations.

It is a scientific fact that constructive imaginatio the ability to foresee—is limited by what we see and h seen. This being true, we can picture the effect actual photographs of the men, the methods and the chinery of up-to-date manufacturers who have so the perplexing problems of today, and who put t whole trust in enlightened management and the mechanical equipment that the inventive genius of has yet devised. This is the field of Industry Il trated, and we have every reason to congratulate readers, as well as ourselves, over the engagemen so thoroughly competent an Editor to lead in this portant work.

I shall continue to give the editorial policy and duct of the magazine my close and watchful direct but Mr. Farrell will be the active Editor, and both sonally and professionally, he will be responsible for technical authority of every page of the magazine.

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How Can I Finance New Plant and Equipment?

The Place of the Builder's Second Mortgage — What the Manufacturer Must Have to Qualify for a Loan

By Fred T. Ley

ONE of the methods in common use for financing plant extensions is to arrange with the builder, a deferred plan for the payment of a certain percentage of the total value of his contract. How much this percentage may amount to depends upon certain factors which will be discussed in the course of this article.

The formal security for the payment due (*which is actually a loan by the builder to his client*) may be arranged in several ways. It may be a series of notes of varying length of life; it may be a second mortgage on the real estate or even on the completely equipped plant; or it may be a block of preferred stock. But whichever of these forms is used, they all have this in common, as far as the lender's policy is concerned: That they must be amortized year by year and that the period of final liquidation must be a comparatively short one.



FRED T. LEY

Loans of this kind are not easy to negotiate. Builders are in the construction business, not the financial. Their success, like that of a manufacturer, depends upon the number of times working capital can be turned over annually. Consequently, loans such as we are discussing are somewhat in the nature of an accommodation to a regular client or to one able to furnish the necessary security. *They are only desirable from the builder's viewpoint, when they meet certain conditions of return which would compare favorably with his usual earned profits.* In other words, they must carry with them a rate of interest and sometimes a rediscount rate, the aggregate of which will net the builder as much as the same amount invested in his own business. I believe there can be no question on the soundness of this principle.

Moreover, it is obviously unreasonable to expect that the low bidder, who has secured a contract, in keen competition, without foreknowledge that he would be called upon later to help finance the operation, can maintain his competitive price under the latter condition. He takes chances enough in any case without being called upon to face a loss on the contract and to be a co-lender as well. The proposal most commonly made to the builder is that he place his profit (considered to be ten per cent.) upon a deferred payment basis. The basic assumption here is that the contract *will* earn ten per cent. If competition has forced the price down, in the first place, to a point at which he cannot make ten per cent., it is obvious that he is digging into his own capital to lend the manufacturer money. There is nothing sound about this from an economic or business viewpoint.

Consequently, the first essential of a co-financing plan in which the builder is to take part is that the builder's

*Mr. Ley is President of Fred T. Ley and Company, Builders. He is a graduate of the school of experience. During the thirty years of his company's history, he has constructed a vast number of industrial buildings. Among them: A plant for the International Motors, Willys-Overland, Whitehead & Hoag, Holtzer-Cabot Electric Company, United Drug Company and many others. In addition, he built Camp Devens and the Nitrate Plant at Perryville, Maryland during the war. Office buildings constructed by his firm are innumerable. Among them are the Fisk Building in New York and the Ley Building, which he owns.

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contract price be sufficient, in his opinion, to assure a normal profit. Probably the fairest way to carry through a plan of this kind is to require the contractor to name an upset or guaranteed price—a percentage of profit having been agreed upon, together with the items which are to constitute the cost of the operation. It is a mere matter of accounting to determine the actual total cost after the operation has been completed. If this total is less than the upset price, the difference is credited to the client. Thus the builder and client are both protected.

To return to the three forms by which the loan transaction may be secured: The period of the loan in any case is usually not less than three years, nor more than five. It is customary to amortize the same amount of principal each year, although this is subject to variation. The interest rate which the notes carry varies from six per cent. upward, as the condition of the security or of the money market warrants.

If the loan is secured by a second mortgage, the same conditions as to life, amortization and interest prevail. But here other elements enter into consideration. It is customary to consider that the second mortgage is purchased at eighty or thereabouts, instead of at par one hundred. This is the ordinary procedure in other forms of second mortgage.

If preferred stock is accepted by the builder in lieu of partial payment, similar conditions prevail. Among others, the stock must be retired in annual blocks just as the notes must be taken up or the mortgage amortized.

The second mortgage is probably the most general form of security required by a builder from the manufacturer for whom he builds. This brings us to the consideration of the tangible assets behind the second mortgage.

Capital invested in timber and masonry is considerably less productive than the same capital invested in tools and machines. Therefore, it is axiomatic that a manufacturer who sets out to build a new plant will adopt every possible means to keep the investment of his own cash in buildings to a minimum, so that the capital thus released may be converted into equipment whose earning power is positive and continuous. There are several ways in good practice, of financing plant additions by outside capital. One of them is the contractor's deferred payment plan. How this is handled and how the manufacturer can avail himself of it, are told in the accompanying article by Mr. Ley, out of a breadth of experience, second to that of no other industrial builder in the country. We plan to publish discussion of other methods of financing extensions to the factory, in future issues.—The Editors.

To consider the simplest case first, namely that in which the plant extension consists of the construction of a single detached building on some part of the plot. The building may be connected by bridges and tunnels with the rest of the plant, but this does not affect our discussion. Because the security for the second mortgage is a second lien upon the building and the land it occupies.

The value of the security here depends wholly upon the marketability of the parcel of land and the building which stands upon it. If the plant is far out in the country, away from lines of communication, in a neighborhood of low values; or if the parcel, itself, is so located on the plot that it is inaccessible, the value of the land is negligible since its saleability is doubtful.

In the same way, if the building has been specially designed for one industry and is suited to no other or to very few others, its value is practically nil.

On the other hand, if the parcel abuts on a street in a section of a town or city in which land is in demand at good prices, the real estate part of the security is satisfactory. But as the full value of the land is probably already required as security for the first mortgage, it is necessary that the building also have a good market value, so that the combined security may leave a reasonable equity above the first and second mortgages. This means that the building should be of a good, plain, commercial type, convertible, without much expense, for general, industrial or business use.

A standard multi-story building of reinforced concrete steel or mill construction, rectangular in shape, full equipped with elevators, plumbing, heating and lightin equipment and located upon an important street, repre sents a typically acceptable security for a builder's secon

(*Continued on page* 28)

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Acetylene Welding in the Industrial Plant

By E. H. Sharp



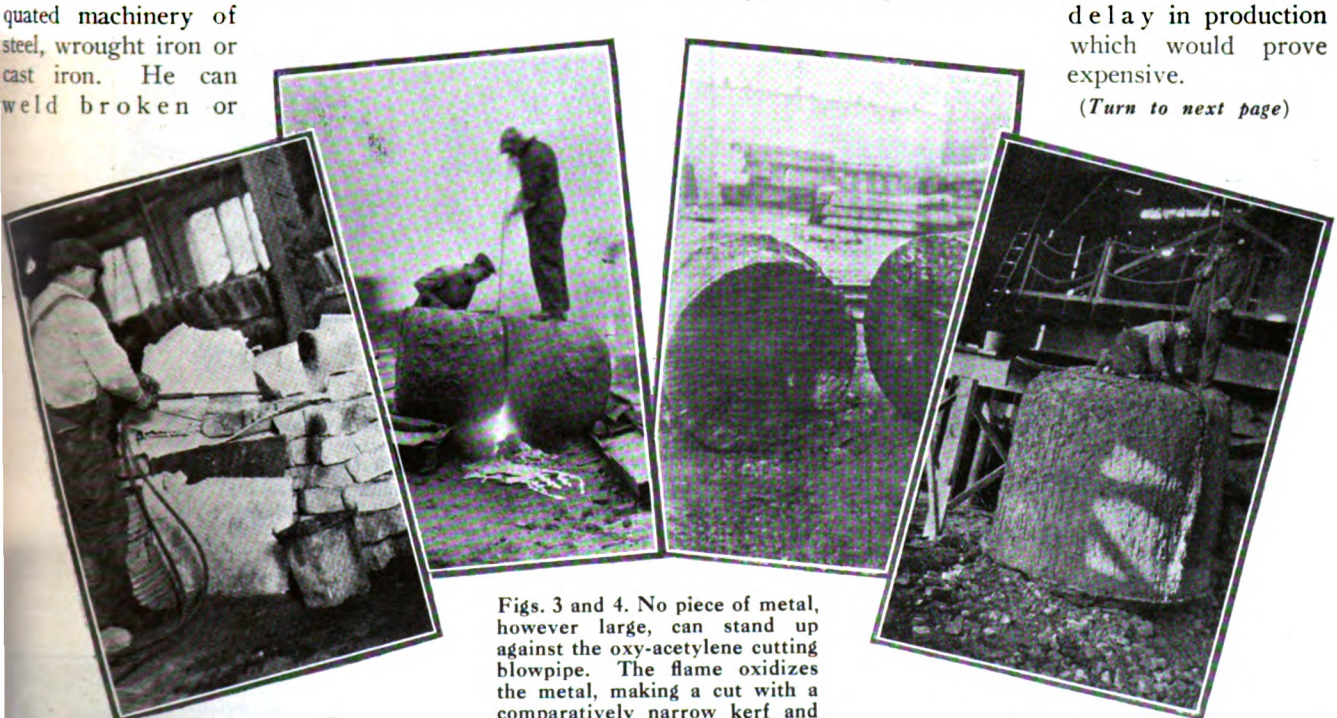
Fig. 1. Hundreds of these vibrator gears were being scrapped by a cotton mill until a welder convinced the manager it would be profitable to reclaim them. The process involves welding broken gears and building up worn or broken teeth. Sometimes as many as 5,000 gears are reclaimed in one lot.

THE blacksmith as an aid in maintenance work is disappearing from his post in the industrial plant just as he is from his time-honored position under the spreading chestnut. The welder is replacing him.

While the blacksmith can shape and reshape, the welder can do this and more. The welder can work faster. He can tear down and build up, fabricate and dismantle, all with ease, economy and speed. He can weld aluminum and cast iron, the despair of the hammer-and-forge blacksmith.

A welder's tools are no more extensive or expensive than a blacksmith's. Welding and cutting tools are the main items of his equipment, his supplies are oxygen, acetylene, welding rods and flux or an electric welder. Equipped with these, he is ready to tackle any job that comes to him from any department. He can build up gear teeth or cut into movable sizes cumbersome antiquated machinery of steel, wrought iron or cast iron. He can weld broken or cracked machine parts and tools so they are as good as new; he can drill holes in metal of any degree of purity or thickness; he can repair broken pipe lines or erect new ones; fabricate tanks, vats and containers of sheet or plate metal—steel, aluminum, copper, monel metal or nickel; build gear and machine guards; in fact do almost anything with metal that a carpenter can do with wood. In every one of these functions he saves his employer money, for it is usually far cheaper to produce new equipment or to repair old parts by welding than to replace; and the time saved alleviates a delay in production which would prove expensive.

(*Turn to next page*)



Figs. 3 and 4. No piece of metal, however large, can stand up against the oxy-acetylene cutting blowpipe. The flame oxidizes the metal, making a cut with a comparatively narrow kerf and in a very short time. Cutting a 42-inch roll is an easy task.

ig. 2. The casting was oxy-elded in a preheating furnace. he asbestos paper laid over the rnace was cut away around the ortion of the casting to be elded, and the operation was erformed through this opening.

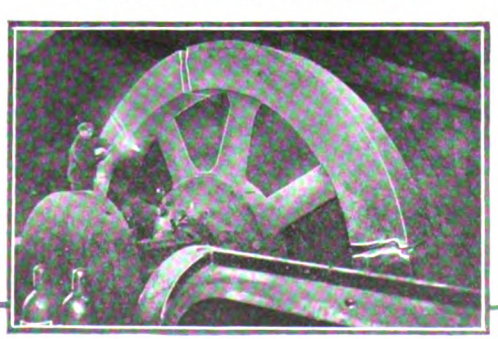


Fig. 5. A 7-foot crack opened up in the cast iron pot shown above. The pot was turned over and the crack bevelled for welding. After being preheated in a firebrick furnace, the pot was welded with cast iron rod.

Fig. 6. Cutting this 60-ton cast iron fly wheel was but one of the jobs performed in the demolition of equipment in a large power plant.

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Repair Costs Cut By Using

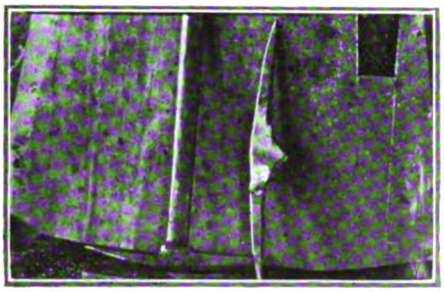


Fig. 8. Small tools are profitably repaired by welding. These picks were saved from the scrap heap in a few minutes with the blowpipe and welding rod.



Fig. 7. Extending a motor shaft by welding on an extra piece to take a wider pulley is another example of welding. Preheating the pieces shortened the time of the work.

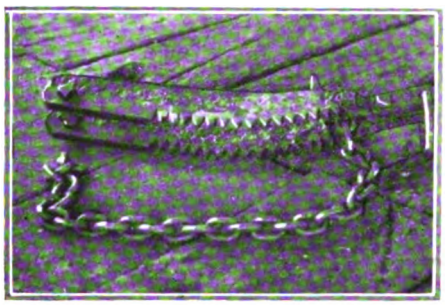


Fig. 9. The worn teeth on this control sector were easily built up by welding.

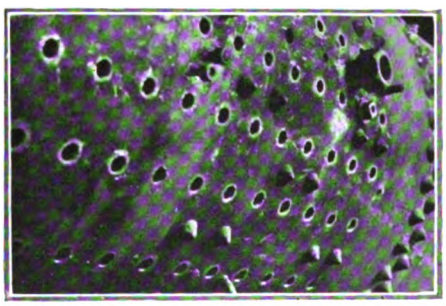
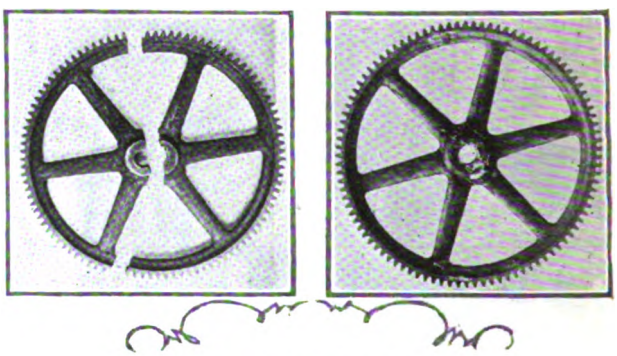


Fig. 10. With his oxy-acetylene cutting blowpipe a welder was able to remove 50 staybolts from this boiler in an hour without bruising the threads.



Figs. 11 and 12. Broken gears such as this are easily repaired by welding. The break almost always occurs at the root of the tooth, the weakest point, so that it is seldom necessary to refinish a tooth after welding.

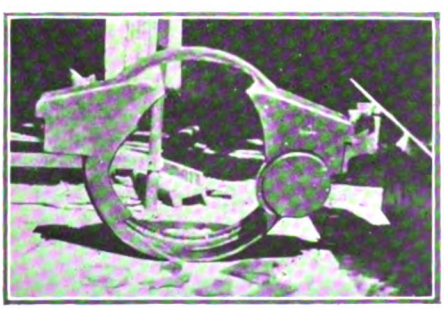


Fig. 13. A broken flywheel housing ready to be welded. The finished job is shown in Fig. 18 on the next page



Fig. 14. It took an operator only a few minutes to repair this cracked wrench. Similar jobs are simple for the welder.

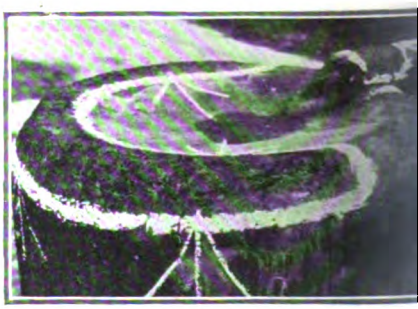


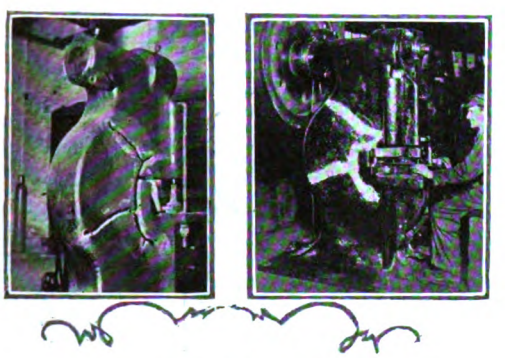
Fig. 15. The white marks indicate where this casting was welded and made serviceable again at a large saving.

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Oxy-Acetylene Blow Torch



Fig. 16. Heavy levers required to trip the doors of a coal pocket receive excessive abuse. A blowpipe, some welding rod, a few minutes' time, and the welder has repaired a broken lever.



Figs. 20 and 21. When this 4,000 lb. punch press broke through the frame, the plant where it was installed was seriously embarrassed, since it was used in an important step in production. A new model with a new set of dies would cost $2,500. At a cost of less than $200 the press was made as good as new by oxy-welding.

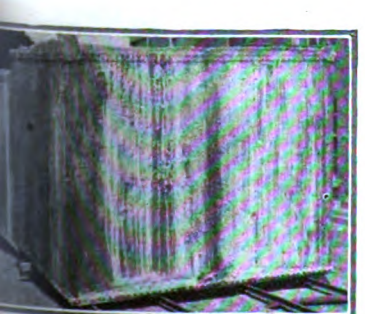


Fig. 22. Twenty of these carbonization tanks were demolished in short order to make room for new equipment.

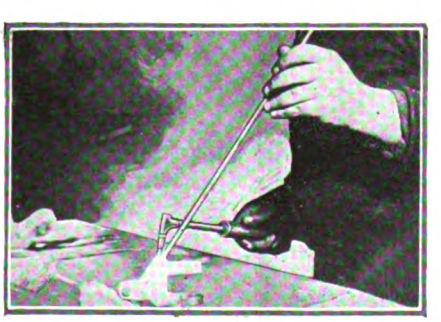


Fig. 23. Often the repair of a small machine part, such as this cast iron shackle, saves much annoying and expensive delay.



Fig. 17. With the oxy-acetylene cutting blowpipe an entire hoisting plant was demolished in 37 hours.



Fig. 18. When this flywheel housing was practically destroyed, welding gave it a new lease on life.

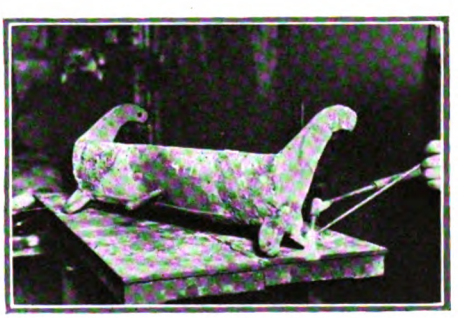


Fig. 19. This top casting of a wood shaper broke into eleven pieces. The welder is shown in securing the last piece in position.

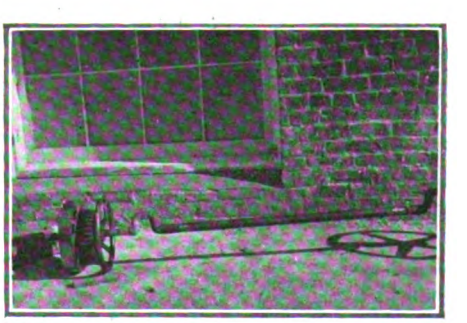


Fig. 24. Broken crank shafts are easily welded. This was done in the welding shop of a textile mill and prevented delay.

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Lighting Contrasts



Fig. 1. At right—This book bindery of a publishing company is an example of inadequate illumination. Overhead lighting is supplied only in the center bay and the side bays are left in shadow, with the exception of bright patches of light from local lamps which, through contrast, emphasize the darkness. Glare is excessive in such surroundings.



Fig. 2. Above—The same book bindery as in Fig. 1 but so changed that it can be recognized only with difficulty. General overhead lighting with standard dome reflectors has been installed, giving an even intensity of illumination throughout the entire working area. Work can now be carried on more rapidly and efficiently, without fatigue or eye strain from glaring light sources and contrasts in brightness.

Fig. 3. In this press room the arrangement of units is satisfactory but the intensity of illumination is inadequate for the work.



Fig. 4. The same press room with an improved installation. Efficient standard dome reflectors have been supplied and the wattage of the lamps has been much increased.



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Good Lighting Essential to Efficiency and Safety

Even Illumination Prevents Waste of Productive Time as Well as Accidents

By H. J. Littlefield

THE one obstacle that, more than any other, has barred the way to good lighting in the industrial field is the difficulty of visualizing the improvements brought about by proper and adequate lighting. The executive is prone to say, "My lighting is all right. I do a large volume of business and make a fair profit. Why should I fuss about with my lighting?" If, however, he could be given the opportunity of seeing for himself the difference between poor factory lighting and good factory lighting, he would realize what proper lighting means in terms of working efficiency.

One of the methods sometimes employed to reveal to the executive the improvements incident upon the installation of better lighting, is the trial installation. An equipment manufacturer or a power company arranges with the manufacturer to install in part of his plant for a time, with-

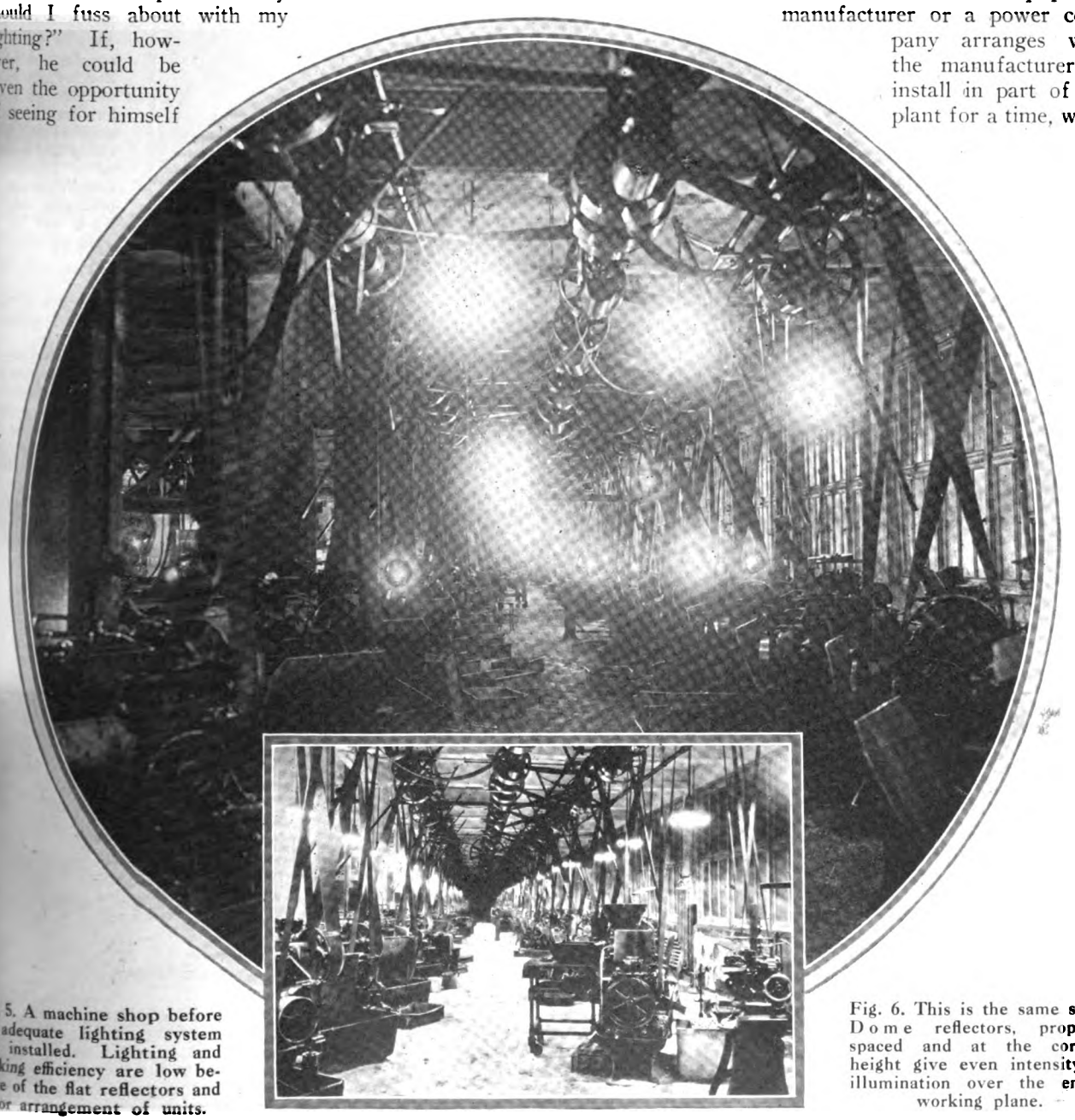


Fig. 5. A machine shop before an adequate lighting system was installed. Lighting and working efficiency are low because of the flat reflectors and poor arrangement of units.

Fig. 6. This is the same shop. Dome reflectors, properly spaced and at the correct height give even intensity of illumination over the entire working plane.

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out cost, improved lighting equipment, so that he will be given an opportunity to observe for himself the effect of light upon production and working efficiency. After this trial installation, in the great majority of cases, the manufacturer decides to have the higher standard of lighting throughout his plant.

It is not, however, always possible to make such an arrangement. How, then, may the manufacturer be shown the improvement that results when good lighting is substituted for poor lighting, or better lighting for fair lighting? One of the simplest and best means of illustrating the really amazing difference that results when good lighting is installed is the use of "before and after" pictures. These are merely pairs of views of the same working areas before and after the installation of improved lighting systems. These photographs show the manufacturers what other plants have gained through better lighting, and what he can gain if he will make the comparatively small investment necessary to install a modern system of illumination. It is impossible to glance over "before and after" pictures of the sort shown in this article without seeing how proper lighting improves working conditions and promotes efficiency, with a consequent increase in production.

The photographs on these pages and the next are shown through the courtesy of a number of manufacturers of standard industrial lighting equipment, and emphasize more effectively than can words, the results obtainable through the application of correct principles of shop illumination.

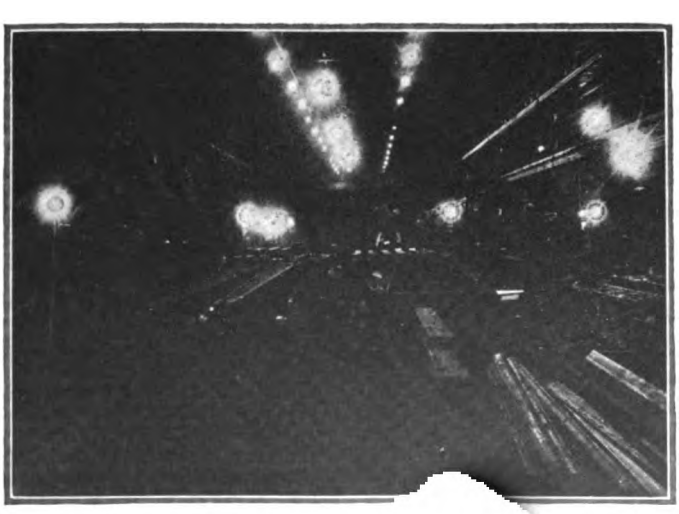


Fig. 7. This is a foundry where the location of the units is satisfactory but where the intensity of light is inadequate. Conditions in a foundry are ordinarily rather dangerous and it is essential that sufficient light be provided to make footing safe, to say nothing of making possible efficient work.



Fig. 8. This is a view of the same foundry as shown at the left. The lamps have been equipped with standard dome reflectors and the number of outlets has been increased thus raising materially the intensity of illumination. Conditions are now perfectly safe and work can be carried on efficiently

Fig. 9. Below—An example of poor shop lighting. The lamps are equipped with inefficient flat reflectors and a large proportion of the light is absorbed by the dark walls before it can ever reach the work. Working conditions are bad.



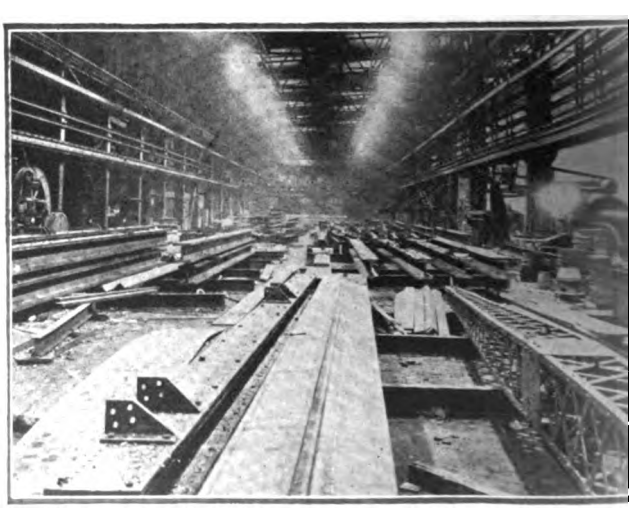


Fig. 10. Below—The flat reflectors have been replaced by high mounted prismatic glass units which send the light directly upon the work thus avoiding the high absorption loss. Obstructions are now clearly visible and the possibility of accidents is minimized

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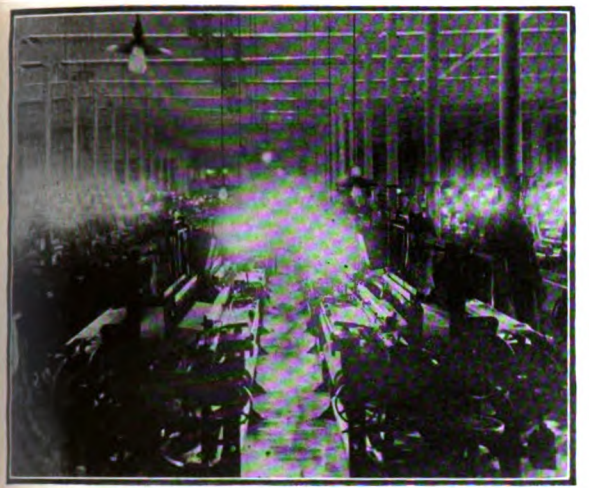


Fig. 11. A textile mill improperly lighted. The units are mounted too low, thus necessitating a larger number of outlets than necessary. The flat reflectors waste light and cause glare. In this case, improper application of lighting principles causes a much greater current consumption than is actually necessary, without giving light of the proper intensity.

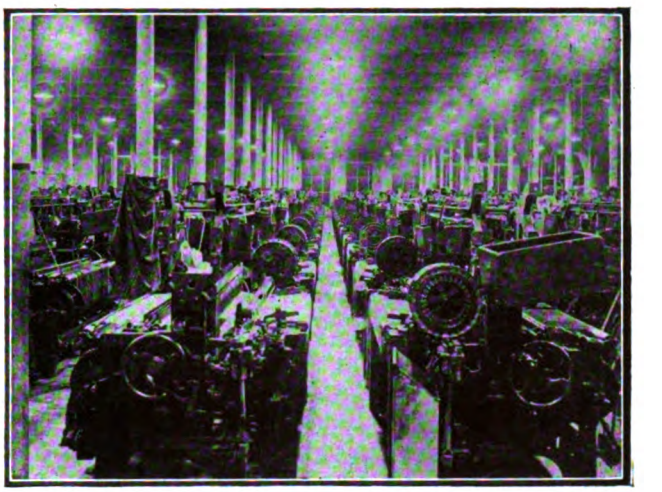


Fig. 12. The lighting in Fig. 11 as changed. High mounted frosted units in dome reflectors, give higher average intensity on all surfaces, without glare; and without material increase in current consumption.

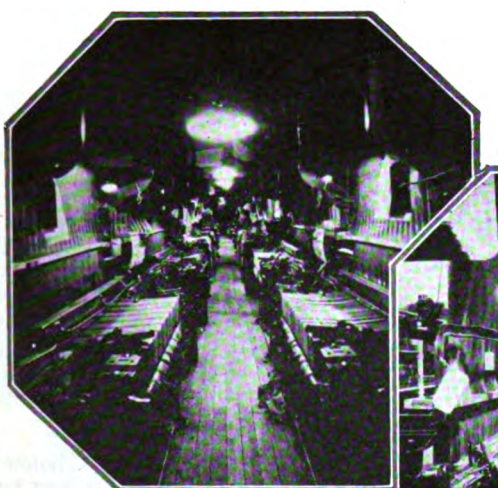




Fig. 13. Jacquard looms in a textile mill lighted by 50 watt lamps in flat reflectors. The lamp is not adequately shielded and glare is excessive. The low mounting of the units leaves the ceiling in darkness. Working efficiency is greatly reduced.

Fig. 14. Prismatic glass units here supplant the inefficient system shown in Fig. 13. Higher wattage lamps are used and some of the light is permitted to reach the ceiling, thus eliminating the annoying contrast noted under the other system. The units are mounted nearer the ceiling, thus reducing the possibility of glare. There is a higher intensity of light upon all surfaces.



Fig. 15. The composing room in a printing plant, poorly lighted. Lamps are scattered haphazard about the room on drop cords. The lack of any general overhead lighting and the use of cone reflectors on the local lighting units create glare and shadows.



Fig. 16. The same composing room. Both the overhead system and the local lights have been fitted with standard dome reflectors, thereby giving even illumination and doing away with tiring contrasts between high lights and deep shadows.

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How to Choose the Right Kind of Short-Center Drive

Direct Methods Which Eliminate the Friction Loss of Complex Counter Drives

By William Staniar

THERE have been many theories advanced as to the reasons for short-center work losses, but looking upon the subject from an empirical standpoint, a short-center drive naturally requires a belt of short length; which results in small total elastic stretch, based on a certain amount of necessary elasticity per foot of belt for the efficient transmission of power. With a long center drive, the total elastic stretch is greater, resulting in the arc of contact being increased due to the sag of the loose side of the belt. A short-center drive must overcome this lack of elasticity and decreased arc of contact by a high tension belt, which is not by an means as flexible.

There are a number of rules for determining the proper center distance for economical and efficient driving based upon pulley diameters, powers and speeds, but the table on page 19 is based on normal ratios and actual plant experience; therefore, when operating conditions permit, the distances given will be found approximately correct.

For the powers designated in the same table, the center distances given should be adhered to, otherwise the ordinary belt drive has not the opportunity to function properly and all the ills of short-center work

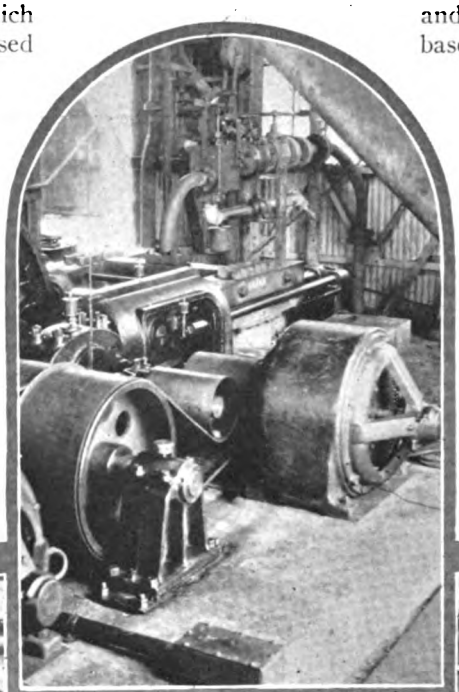


Fig. 1. At the right is an illustration of an automatic idler device which permits of efficient driving this hydraulic pump by a 150 hp. motor, in 4 ft. centers.

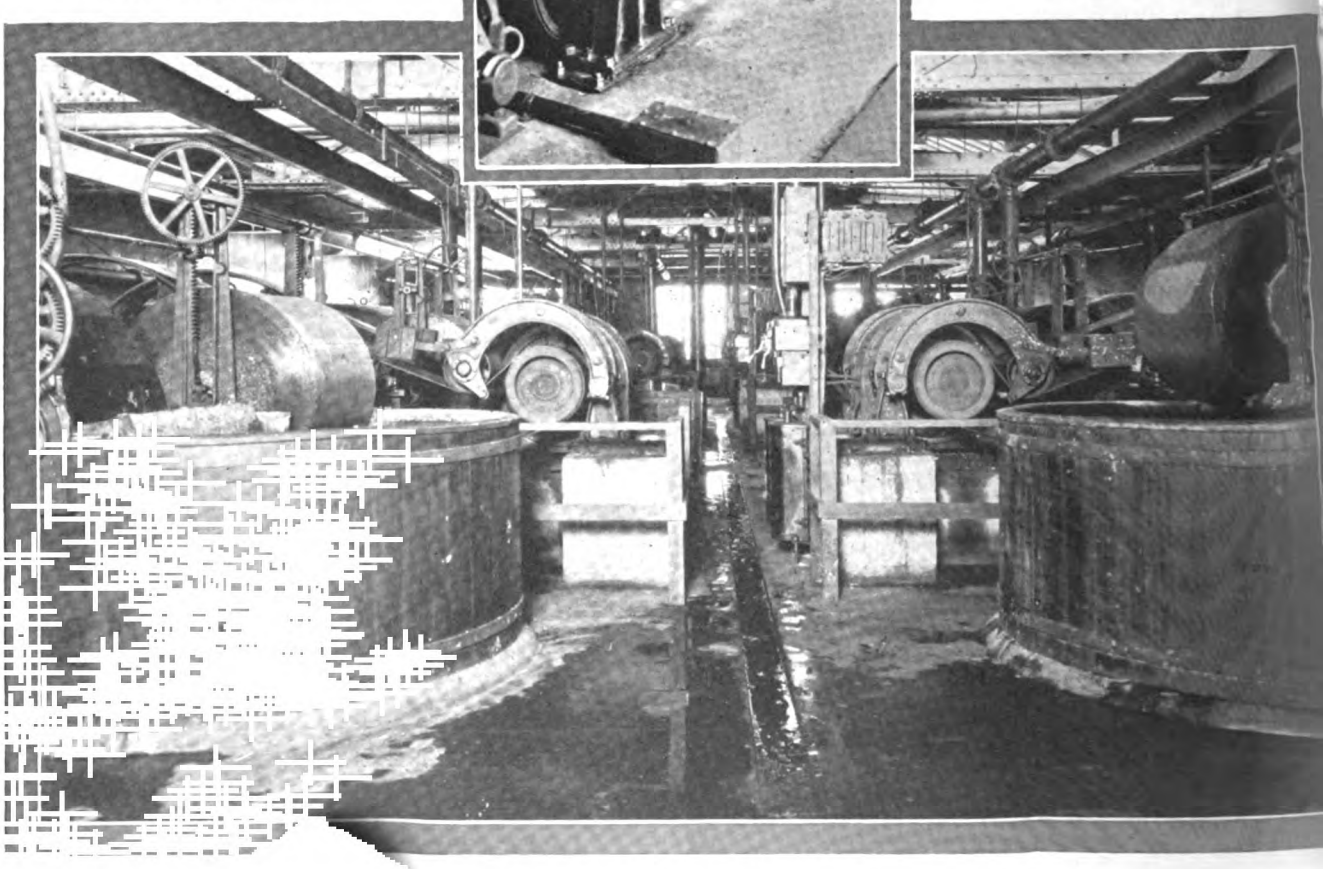


Fig. 2. Below—A battery of beaters, driven by 100 hp. motors, on 10 ft. centers; another case where the automatic idler device solves a difficult problem.

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are brought into play. Of course, on 1 to 1 or 2 to 1 ratios the distances given can be shortened to a certain extent, but such ratios are uncommon in practice, particularly, on prime mover installations. Ratios over 4 to 1 have a detrimental effect on the arc of contact of the driver on short-center work and as this factor has a very definite bearing on the amount of power a belt will transmit, the fallacy of such installations is obvious.

1 to 4	horsepower—	6′ 0″	center	to	center	of	pulleys	
5 " 9	"	— 8′ 0″	"	"	"	"	"	
10 " 14	"	—10′ 0″	"	"	"	"	"	
15 " 24	"	—12′ 0″	"	"	"	"	"	
25 " 39	"	—15′ 0″	"	"	"	"	"	
40 " 49	"	—16′ 0″	"	"	"	"	"	
50 " 74	"	—20′ 0″	"	"	"	"	"	
75 " 100	"	—24′ 0″	"	"	"	"	"	

Above 100 horsepower should be considered special.

The arc of contact is the governing factor of belt tightness because the greater the circumferential contact between the belt and the pulley, the smaller is the initial tension required to transmit any given amount of power, and, therefore, a smaller transmitting medium may be used. A small arc of contact necessitates a tight belt and a larger belt. Slippage is aggravated on a short-center drive by small arc of contact, and particularly on the smaller pulley of the two. To overcome low contact, high belt tension is necessary. This results in high bearing pressure which again results in high maintenance and loss of power.

It is often possible to increase the arc of contact by crossing the belts, but this is bad practice on drives of short-centers and small pulleys unless the belt is of small dimension and is not required to transmit much power.

The wear and tear on machinery and loss in power and production by the short-center belting installation can be almost entirely eliminated if manufacturing industry will take advantage of the efficient short-center driving methods and devices which are on the market. These methods and devices are the result of years of research and experimental work, years of costly supervision and years of investigating materials that are best suited for the requirements; work done by transmission appurtenance manufacturers who have sensed the losses involved through the use of the ordinary short belt drive.

The study and analysis of many plants, involving all classes of industry, have revealed the presence of a great number of ordinary short-center high-ratio belt drives; owing to the fact that the managements either are not aware of the existence of methods to overcome the difficulties of such installations or they are loth to make an initial expenditure which will



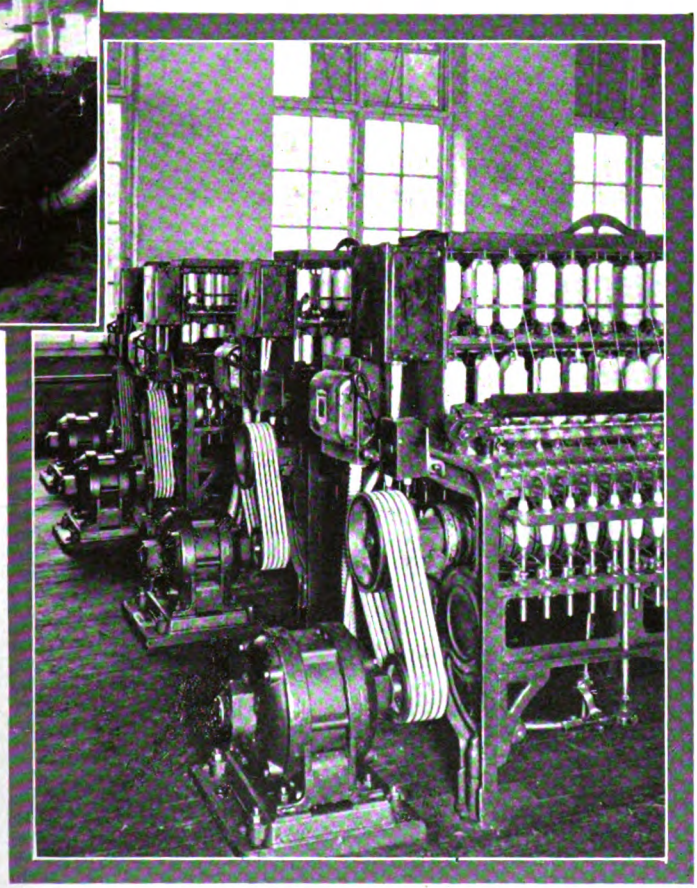


Fig. 3. Above—this 40 hp. motor, at 1,750 r. p. m., drives a miller at 1,150 r. p. m., on 36 inch centers, by means of V-shaped fabric and rubber belting on grooved pulleys.

Fig. 4. At the right is shown a battery of cotton spinning frames driven by individual 10 hp. motors. The same type of drive as shown in Figs. 3 and 5 is employed here to permit extreme short-center drive.



Fig. 5. This is another illustration of the application of the V-shaped fabric and rubber belt described in the text. The 100 hp. motor is here driving a cotton gin, on 3 ft. centers.



Fig. 6. An ingenious new device, of foreign origin, designed for high-ratio, short-center drive. The illustration shows it as applied to a line shaft, with belt-shift incorporated.

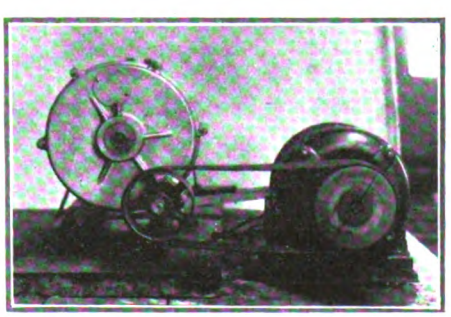


Fig. 7. The drive mechanism shown in Fig. 6, and described at length in the accompanying text, is here applied to a 5 hp. motor to give an 8 to 1 ratio.

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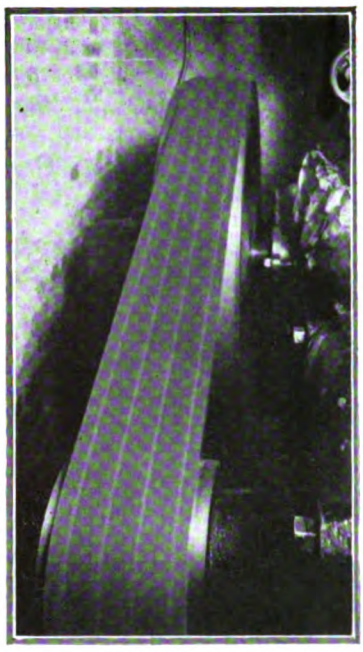


Fig. 8. A special belt, with soft strips rivetted on the driving surface, which has been developed to meet the requirements of short-center drive; shown here on a 7½ hp. drive of 5 to 1 ratio, on 34 inch centers.

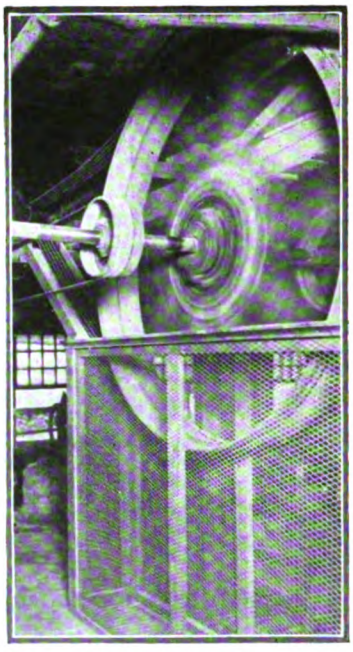


Fig. 9. Another illustration of the application of the special belting shown in Fig. 8. On this 12 hp. drive, with 12 to 1 ratio, the pulleys are spaced on 9 ft. centers. The construction of this belt is elaborated upon in the text.

eliminate a constant drain on their operating budget. The chief object of this discussion is to bring before plant executives, devices and methods that are readily available, the first cost of which is but a trifle when compared with the operating results which may be obtained.

In Figs. 1 and 2 are shown devices known as the automatic idler system, the chief function being to materially increase the arc of contact of the belt on the driving pulley. The fulcrum or idler pulley is applied to the belt scientifically or in such a manner as to equalize the belt tension and increase the arc both permanently and automatically and in accordance with the load transmitted. The permanent increase is attained by careful design of the system and the proper location of the idler fulcrum. The automatic increase is accomplished by wrapping every possible inch of belting around the smaller of the two pulleys. The elongation of the belt due to its elasticity is in synchronism with the variations in the power transmitted. Therefore, when the power is maximum the arc of contact and the grip of the belt on the pulley are also maximum. Tests and experience have proven that this system is not detrimental to belt life if the proper endless type is employed.

The system shown in Figs. 3, 4 and 5 is an adaptation of the English rope method with the exception that it employs V-shaped rubber and fabric endless ropes operating on multiple V-grooved wheels. The greater the load tension, the greater the cohesion of the wedge shaped belt mediums, therefore, slip is almost entirely eliminated regardless of center distances or ratios.

Fig. 5 illustrates a 100-horsepower motor driving a cotton gin, on three foot centers. Another impossible installation for a flat belt drive. This type of drive possesses many attributes and is particularly adaptable for many installations. However, like every other device, it has limitations and no one method should be

(Continued on page 30)

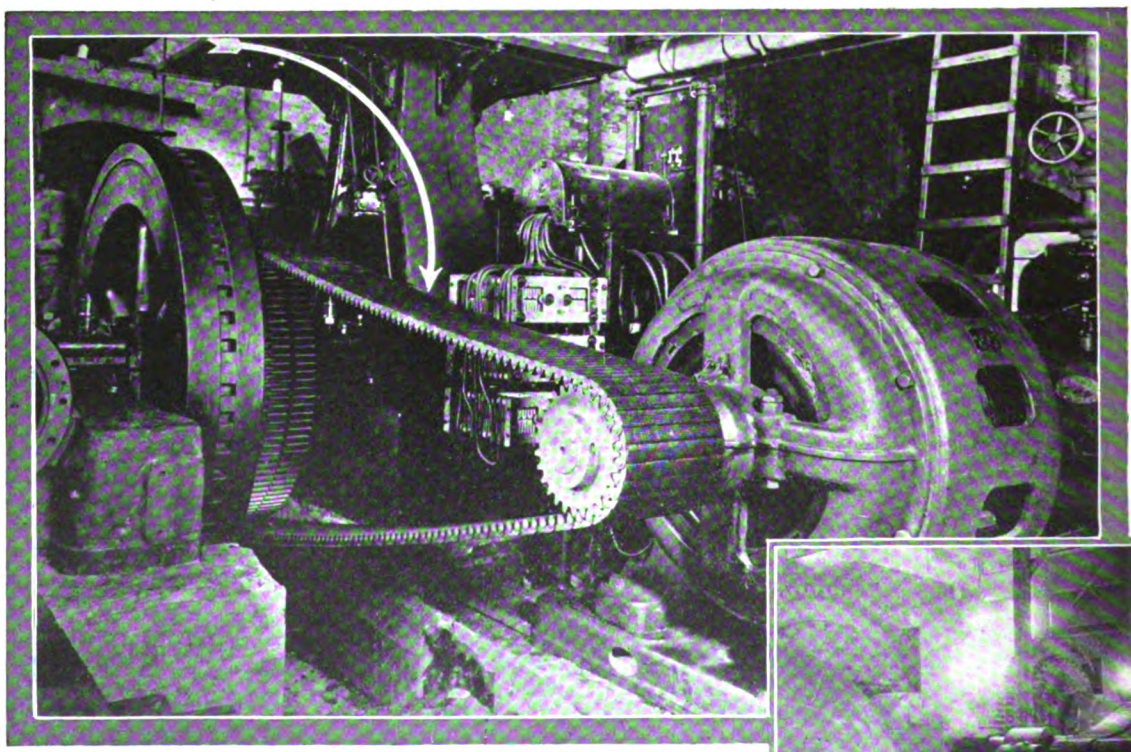


Fig. 10. Above—a 150 hp. motor, at 480 r. p. m., driving an ice machine, on 120 inch centers, with a ratio of 5 to 1. Chain drive meets these conditions excellently.

Fig. 11. Below—Not only short centers and high power (500 hp. but positive drive and atmospheric conditions, make the enclosed chain drive a logical choice in this cement mill installation.

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Balance and Control Production to Meet Seasonal Requirements

Idle Stock and Unfilled Orders Do Not Occur When the Foundry Schedule is Maintained

By John H. Estes

Production Dept., Bond Plant, American Radiator Company

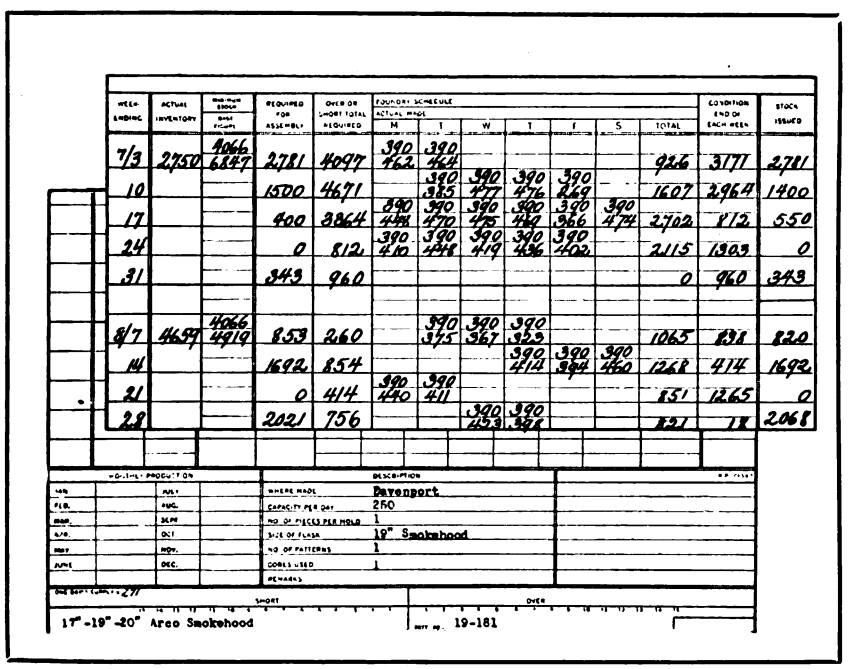
KEEPING a balanced production throughout the entire year is probably the biggest problem of the seasonable product manufacturer. When his peak in sales is reached, he must be able to meet all demands, yet, when the annual slump occurs, production requirements have to be so planned that there will be an intelligent building up of stock which will eliminate the necessity for laying off labor and shutting down machines.

That is the problem of the American Radiator Company, which, in principle, is not unfamiliar to a great many manufacturers. Considering control factors similar, our solution to the balanced production problem will be outlined with the thought that it will, in many ways, offer ideas which can be universally applied.

The specific product considered will be Arco boilers which, incidentally, contain some 250 plate castings. Each of these castings must be manufactured in sufficient quantities to meet the anticipated group requirements as governed by the New York sales research department.

From past experience and present building and remodeling plans, are figured production needs. These are based on a balanced schedule which will keep stock slightly above minimum at all times. Of course, in the boiler business the months of January, February and March would be more or less inactive were it not for special sales promotion campaigns. However, these are antecedents of the production problem.

After compiled figures are received, we must see that they are made into actualities. With the various number of individual parts which go to make up many different types of boilers, this is no task of simple rating. We must segregate the different types and sizes of boilers into classes, and figure the requirements in each class. This is done from a percentage scale. Three month quotas are divided into fifteen day groups. The total number of each size of boiler required is learned, then follows a 25 per cent increase. Fifteen per cent of this increase is made for replacement which cannot be governed by any particular knowledge or through an analysis of incoming sales orders. The balance of 10 per cent. governs a maximum loss which is occasioned at final inspection when it is found that defects of some type or other exists.



Six months production control inventory card for a casting. A minimum of fifteen days stock is to be maintained.

After the total requirements for each boiler have been figured on the three months basis and segregated into fifteen day periods, there follows the necessity of break-up into individual parts which must be carried through production so that finished products may be assembled in all their completeness. With the extremely large number of individual items which must be observed comes the necessity for an absolute control system to insure that all parts will be on hand.

A plate casting control system has been designed to assist in planning production to conform with sales quota and current demand and to aid in securing and maintaining a balanced condition of stock. This method of production planning and stock control results in longer and more favorable runs in the foundry which, in turn, bring about a condition resulting in increased production and greater economy in manufacturing.

Plate foundry production should conform with cored foundry production so that a sufficient amount of the proper size and kind of plate which will correspond to the cored castings will be produced. For example, if the cored foundry is running certain types and sizes of castings, the plate foundry should produce plate castings accordingly and build up a sufficient stock of the corre-

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sponding size. If the plate casting stock room has an ample amount of plate to meet this order, it will be unnecessary to produce except for the purpose of bringing the stock up to a minimum supply figure.

The plate assembly schedule is given to the plate casting department Thursday of each week and covers operations for the week following. If the plate stockroom does not have a sufficient amount of stock on hand over and above fifteen days supply to meet the assembly requirements, immediate steps are taken to order the product made in the foundry. It is essential that the stock room maintain a minimum stock of fifteen days requirements and in the event that the stock falls below this figure, the casting is ordered in the foundry and the stock brought up to or reasonably above the minimum figure.

A visible card system has been designed to insure the accuracy of the plate casting production and stock control. With the use of cards, similar to the one reproduced, production can be planned according to quota and current demand. Very often the current demand differs from the quotas—shortages might occur on certain sizes and styles and result is delayed shipments. In addition to the planning feature, this system also takes into consideration the control of stock on hand in the plate casting stock room. By a signalling procedure, one is able to see at a glance the condition of the stock. If it is below or above a fifteen day minimum supply, the schedule clerk's attention is immediately attracted. If excess shortages or overages appear, steps are taken to correct these conditions and to maintain a balanced stock.

The card itself is designed to cover a period of six months operations for each part on which a control is desired. It shows an actual inventory of stock, monthly, the requirements and the condition of stock weekly, also actual daily production. It shows where the part is made, capacity per day, number of pieces per mold, number of patterns, and cores used, then, monthly production. Sufficient space is allowed for the addition of any information which might prove useful.

The visible card system presents a record which is compact, easily understood and which covers a long period of operations which is invaluable for historical purposes and the laying out of future work. Another feature is the fact that the card shows six months operations doing away with the necessity of setting up records more than twice a year.

It will doubtless be of value to outline the operation of this record form.

The card is indexed according to the part name and pattern number. On the illustration, it will be observed that 17, 19 and 20-inch Arco Smokehood appears on one card. It so happens that this particular casting can be used on all three sizes.

On the extreme right portion of the index margin at the bottom of the card is a small space which tells the machine to be utilized. This control feature is exceptional because it helps in the placing of work.

The Week Ending column at the top of the card allows for the recording of date of operations for the corresponding week. Actual Inventory represents the result of a physical inventory which is taken once a month.

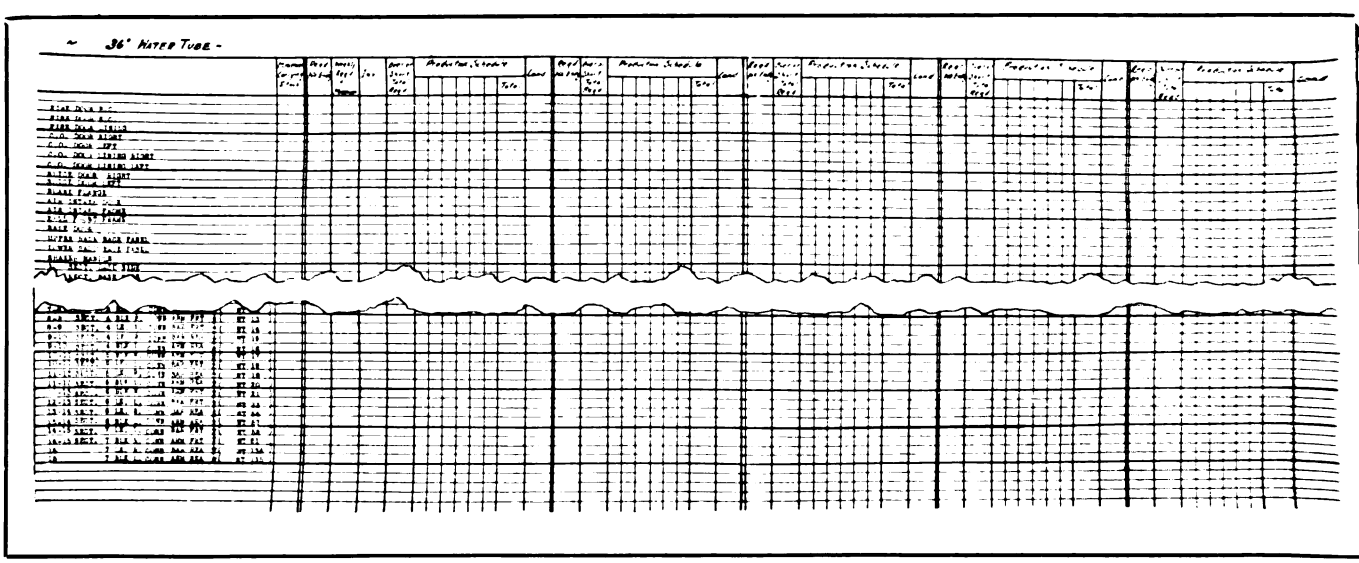
Minimum Stock is the figure which represents a minimum carrying stock of fifteen days supply, and is based on the production quota, being increased 25 per cent. to allow for foundry loss and repair shipments.

Base Figure is the sum of the minimum stock figure and the current weeks requirements. It is used at the time of inventory and forms the basis for the computations of the succeeding period. It is compared with the actual inventory, the result of which comparison shows the condition of the stock in relation to the minimum supply plus the current week's requirements (see Over or Short Total Required). Over is shown in black. Short is shown in red. At the time of next inventory, a new base figure is arrived at which, in turn, is used as the basis for the computations for the corresponding period.

Required for Assembly represents the weekly requirement based upon the weekly plate assembly schedule for boxed plate castings and cored foundry production schedule for cored castings.

Over or Short Total Required allows the posting of the difference between the Actual Inventory and the Base Figure at the time of inventory. This serves as a guide to future production. If the figures appear in red, they indicate that the stock is short of requirements and should be built up. If the figures appear in black and exceed a thirty days' supply, the part should not be run in the

(*Continued on page* 34)



This is the form originally used and now replaced by the form shown on the preceding page. Note its cumbersome size (it is actually twenty inches wide) and the difficulty of following any item through.

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Reclaiming Valuable Material from Factory Waste

By Edward J. Tournier

ASIDE from the ordinary use of conveyors for expediting production and making hard work easy, there are certain applications which serve to reclaim values from foundry refuse, machine shop borings, ash dumps, etc. The most extensive application is one in which some form of conveyor is used in combination with a magnetic device as a separator.

Of the many applications of magnetic separators may be mentioned: the removal of magnetic impurities from material, the quality of which is impaired by the impurities; the reclamation of iron from waste material or foundry refuse; the separation of ores, portions of which are magnetic; the removal of tramp iron from conveyed material which is to be crushed, ground, or pulverized.

Iron of abrasion developed from grinding and pulverizing operations, if allowed to remain in the product, frequently impairs the quality of the product. In glass plants, for instance, the batch often contains small particles of both tramp iron and iron of abrasion. Unless these particles are removed, the glass when resmelted will discolor. Brown spots and other discolorations in pottery and other ceramic products are generally caused by iron particles which were not removed. Insulating strength is greatly lowered if iron is not entirely eliminated from insulating material. Most ceramic plants are equipped with magnetic separators for the removal of iron impurities.

Iron and steel foundry operations create large amounts of refuse, including floor scrapings, chipping-room dirt, and cupola cinder, each of which contains relatively large percentages of iron. The iron is wasted unless it is separated from the other refuse. When separated, it can be profitably recharged and resmelted. Foundries not equipped with magnetic separators for removing this valuable by-product dispose of the refuse material in foundry dumps. Here it is quickly oxidized and rendered valueless.

Many ores are subject to magnetic concentration. Some of the principal ores which have been successfully

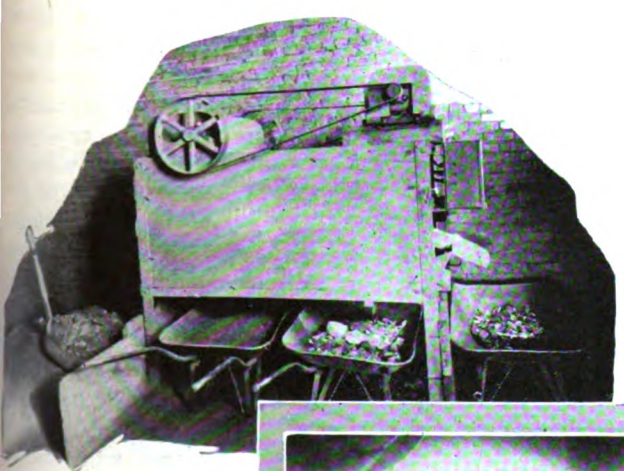


Fig. 1. The magnetic separator shown is in use by the Dempster Mill Mfg. Co., of Beatrice, Neb., making three separations: slag, sand and iron. Its use makes possible a saving of $315 yearly in foundry scrap purchases.

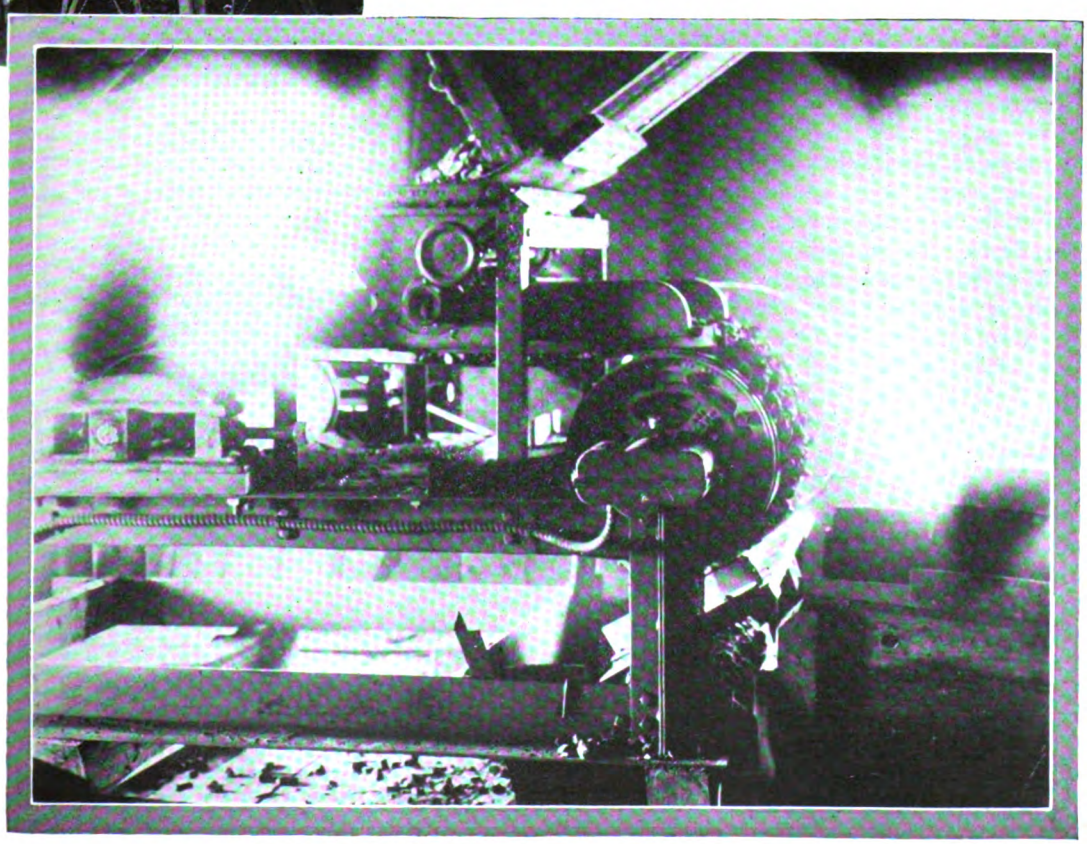


Fig. 2. The magnetic head pulley of a short belt conveyor. The magnetic material is held close to the pulley and is dropped into a box under the conveyor.

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treated in this manner are given in the following table:

Asbestos	Nickel
Barytes	Pyrite
Hematite	Zinc Carbonate
Manganese	Zinc Sulphide
Magnetite	

Different types and sizes of magnetic separators of widely varying characteristics are needed in different industries. During the past thirty years, numerous types of machines have been developed and applied. Most of them are now constructed in a variety of sizes to meet individual plant requirements.

The magnetic pulley is one of the simplest and most widely used types of separators. It consists of a shaft and a cast dynamo steel core wound with concentric coils of insulated wire which are energized by an external source of direct current power. It is installed as a head pulley on a belt conveyor. The surface of the pulley is strongly magnetized. When material is passed over it, the magnetic particles are held tightly against the belt until the belt leaves the pulley. This diverts the magnetic pieces or particles from the regular gravity flow of the main body of material thus effecting the desired separation.

Magnetic pulleys are built in different sizes to accommodate various widths of belt and to develop varying magnetic strength. This strength, of course, increases with the pulley diameter. The larger the diameter the larger the number of turns of wire around the pulley. If the burden on the belt is deep, the diameter of the pulley should be large in proportion.

Under normal conditions, a magnetic pulley is to be preferred instead of a suspension magnet. However, when the depth of the material is great or the conveyor speed is high, it is sometimes desirable to use a suspension magnet in addition to a magnetic pulley. The former will pick up pieces of tramp iron resting on the surfaces of the material, and the magnetic pulley will dislodge pieces which have settled lower in the burden.

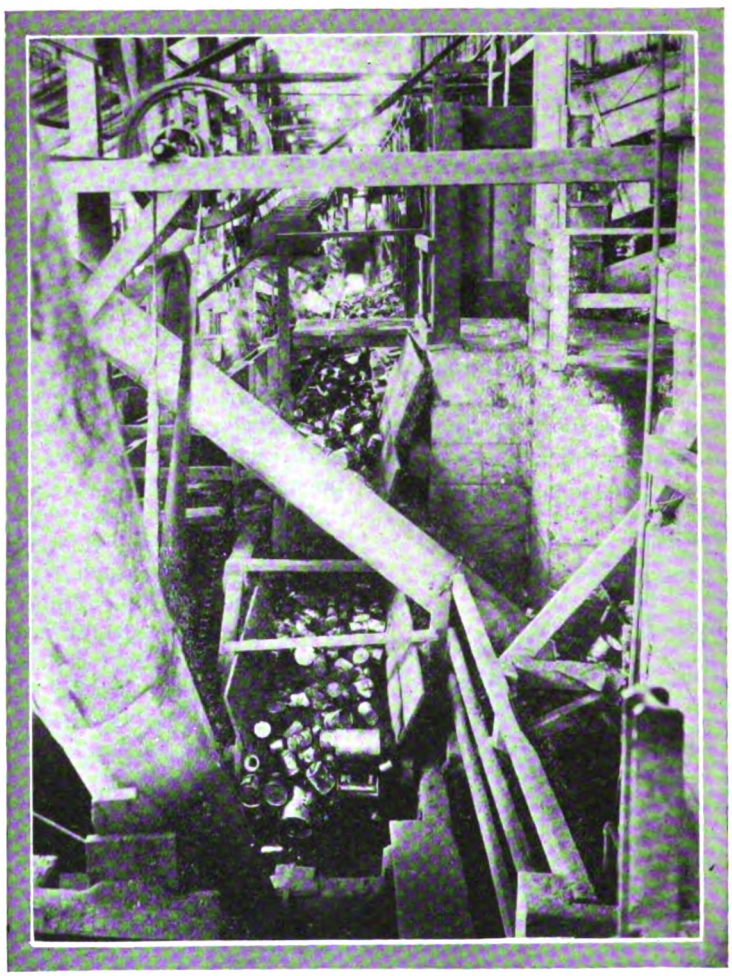


Fig. 3. A Los Angeles foundry makes use of a magnetic belt separator for reclaiming tin cans from refuse. The cans are detinned and other scrap metal is used in the manufacture of sash weights.

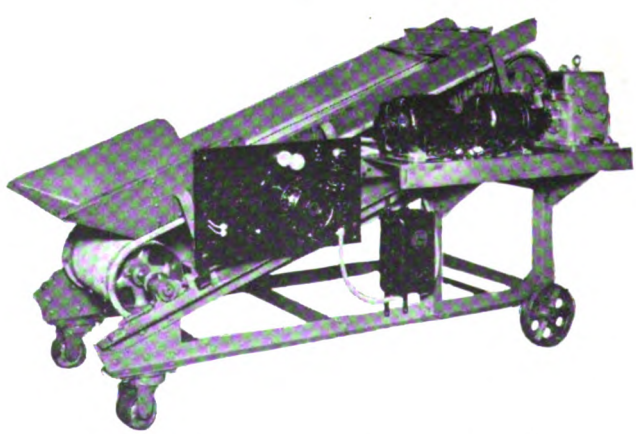


Fig. 4. Belt conveyor with magnetic pulley separator, mounted on a structural steel frame with casters which permit the use of the machine wherever needed. It is operated through a worm gear reducer, and a motor generator set is mounted on the frame.

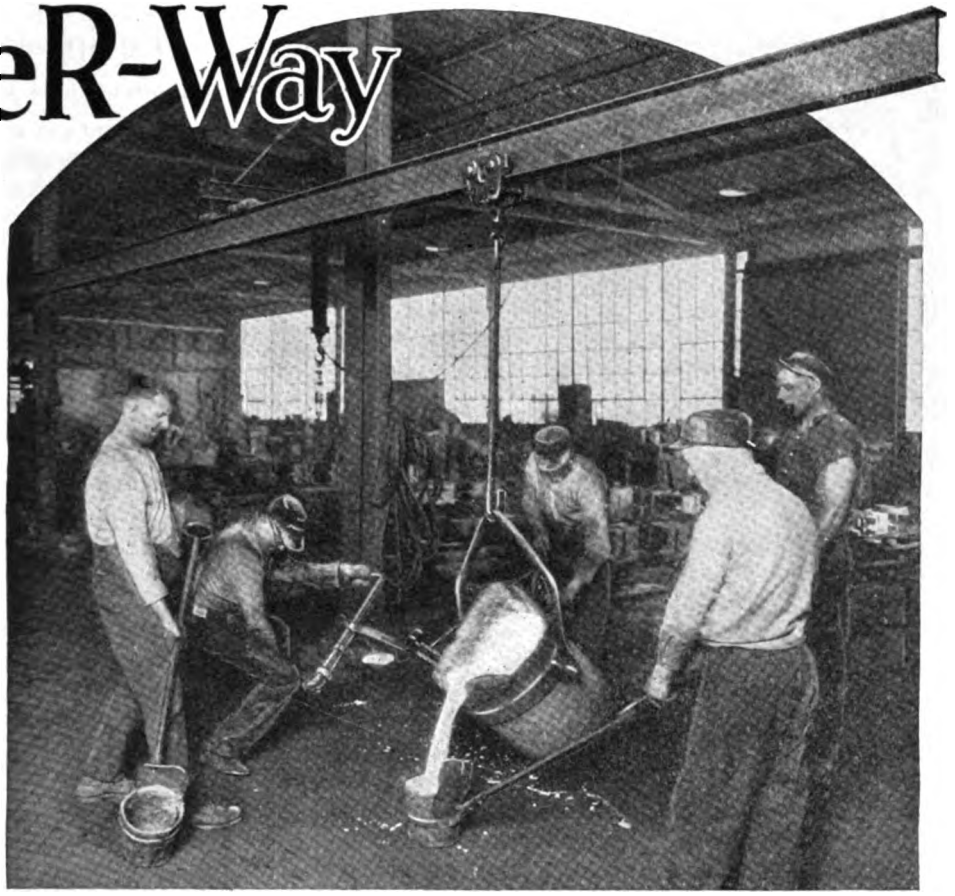
Disk machines, consisting of an inductively magnetized circular disk adjacent to the two poles of a stationary electro-magnet, have wide application. When material is passed beneath the rotating disk, the magnetic portion is attracted to the moving disk while adjacent to the stationary pole pieces. The magnetic material is released when the moving disk passes from under the stationary poles. In other words, the moving disk picks up magnetic material when the material is over the conveyor and drops it when it reaches the side of the conveyor; the diameter of the disk being somewhat greater than the width of the conveyor. The principle of this type of separator is carried out in machines having inclined shaker conveyors with one or more revolving disks placed above them, as well as in belt conveyors with the disk placed above the belts. Machines of these types are used extensively for removing iron from brass borings and turnings. Certain of these are used for concentrating ores and various industrial processes.

Separators of the drum type are of two distinct designs. First those having a series of magnets mounted stationary and adjacent a certain portion of the outside of a revolving drum or cylinder, and second, those having stationary mag-

(*Continued on page*

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OveR-Way



Saves 54 man-hours a day!

Result is increased production, quicker service to customers, and an end to interrupting the work of other departments

T. W. Hall, Purchasing Agent of the Mound City Foundry, St. Louis, says:

"A year ago we installed a Richards-Wilcox OveR-Way System with about 300 ft. of I-beam track for conveying molten iron from the cupolas to the molds. Six ladles of 500 lbs. capacity, hanging from R-W Ball-bearing Trolleys, handle all iron for castings of 500 lbs. or less. Now one man can easily move a ladle, where formerly it required 2 men to carry a 150 lb. ladle.

"Since the traveling crane is usually busy pouring large castings, most of the iron for smaller castings was formerly carried by hand. During pouring hours, we used to call in six men from other departments to help carry iron. Now it is all handled by the regular foundry crew.

"Our R-W equipment has cut our pouring time from an average of 2¼ hours a day to 1¼ hours. Saving six extra men's time for 2¼ hours and the regular crew's for 1 hour means a total saving of about 54 man-hours a day. This saved time is put into increased production, which gives quicker service to customers. It has also put an end to interrupting the work of other departments.

"With the help of R-W equipment, our accident expense has been cut about 30%, and our liability insurance premium has been materially reduced.

"Our R-W track, switches, and trolleys give us no mechanical trouble, and the only maintenance necessary is to oil the trolleys daily.

"We are planning to extend our OveR-Way System so as to carry castings from the foundry floor to the cleaning room."

Write our nearest branch office, and one of the R-W Engineers will call to make a free analysis of your doorway and conveying requirements

Richards-Wilcox Mfg. Co.

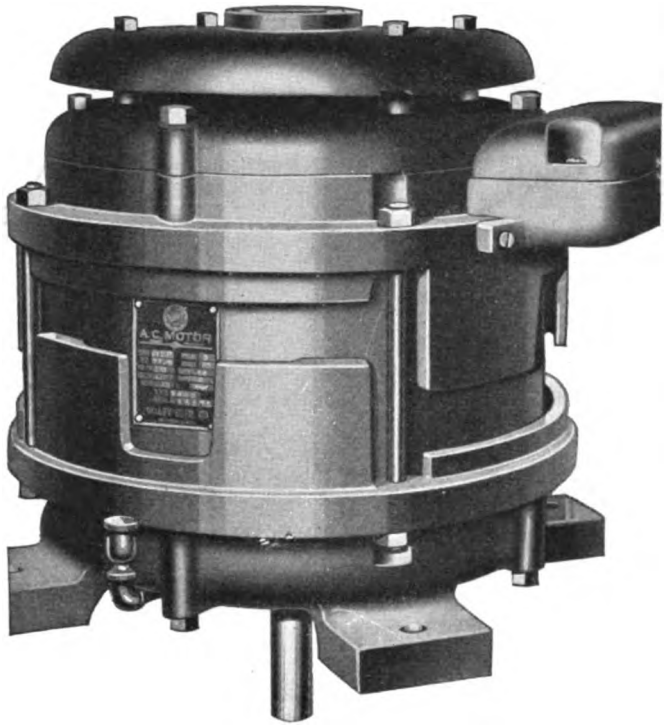
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Valley

How Can I Finance New Plant and Equipment?

(*Continued from page* 12)

mortgage. Where the plant extension is an addition to an existing building in the form of a wing or of extra stories, the situation becomes more complicated. It is easy to arrange that the existing first mortgage, which covers the real estate and buildings, will be extended to include the new wing. In this case, the security for the second mortgage must be so segregated that it will at least cover a building unit which would be saleable in itself. It is certain that the security would not be limited to the new addition alone since it could not be sold independently.

It is not customary to include any equipment such as shop tools or machines in the security since their value under forced sale is small. The mortgagee would prefer to limit himself, at the worst, to the sale of a building rather than of a job lot of tools.

So much for tangible security for a loan of this kind. There are, in addition, some intangible securities which may be taken into consideration in connection with the tangible ones or which may even stand as sufficient by themselves. Of these intangible assets, the profit and loss record of the borrower for a period of say ten years the reputation of his product, the outlook for a continued strong market and, in the case of an open corporation the dividend record, are of outstanding importance They have, of course, a greater bearing as security for notes but may be a deciding factor where the tangible security behind a second mortgage is not considered quite sufficient.

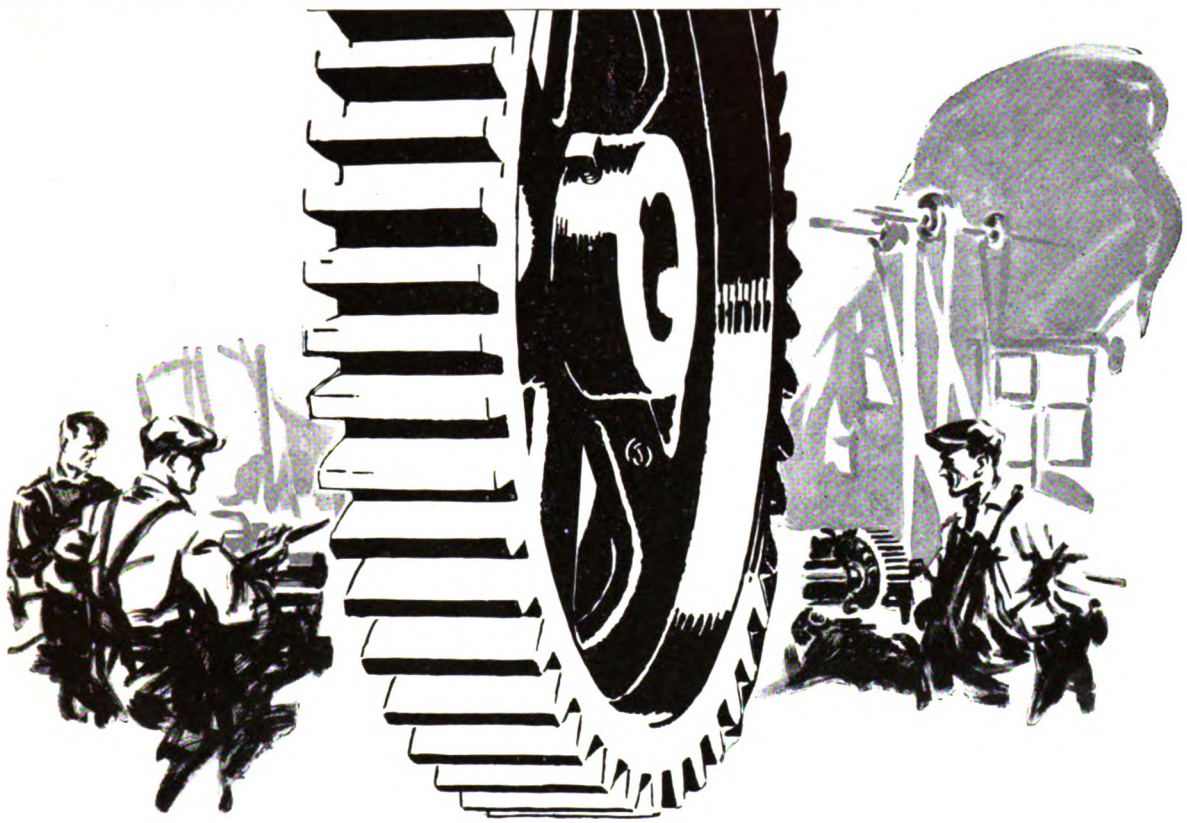
How important these factors may be, is illustrated by the experience of the builder who took back a short term, second mortgage in part payment for the construction of a factory building in the East. It had all the elements of a good security. It was of standard brick and timber construction and was located on a good street in a manufacturing town. It was worth about $200,000, including land. The amount of the second mortgage was in the neighborhood of $40,000, payable in full at the end of the term.

Before the expiration period arrived, the business had begun to decline and the plant changed hands. The new owners made strenuous efforts to build up the business and were slowly getting ahead when the expiration period arrived. The mortgage could not be paid off from funds on hand. Consequently, the owner endeavored to borrow the amount first from bankers in the town and later from all the sources with which he was acquainted throughout his own and the neighboring states. He was unsuccessful. The answer was invariably the same, namely, that the real estate was valuable enough but that the profit side of the ledger was not strong enough to guarantee that the borrower would be able to meet his obligations.

Neither individuals nor institutions want to lend money which they will have to collect under pressure. Coming now to the credit factor, which is the most intangible and yet the most reliable of all, that is, the reputation of the borrower for meeting his obligations. It is a well known principle among bankers that the best risk is the man who has always displayed ability to make money and to pay his bills. In the last analysis, therefore, the manufacturer seeking funds for plant

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Jones Industrial Gears



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Whenever you need gears, get an estimate from us. You will find in quality, prices, shipping dates and other factors that constitute dependable service, that Jones service is constantly reliable.

For your convenience we maintain branch sales and engineering offices in principal cities. Write or telephone our nearest office for a representative whenever you need gears, speed reducers, flexible couplings, pulleys, or other power transmission products. You will find complete information in our General Catalogue Number 30. If you do not have a copy of this catalogue please write the home office for one.

W. A. Jones Foundry & Machine Company

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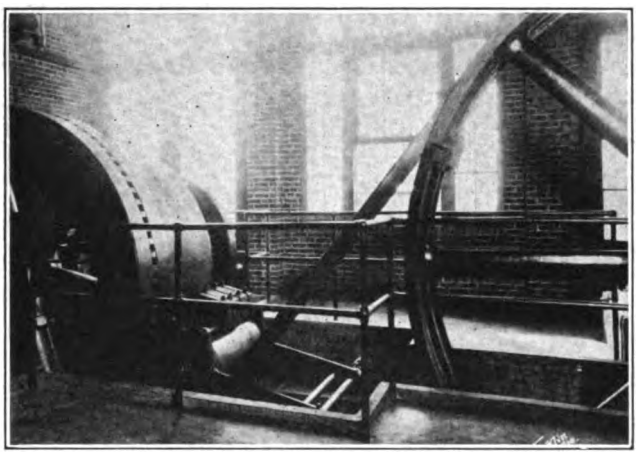
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The LENIX Drive

(Trade mark Reg.)



400 HP. Diesel Oil Engine Driving Ammonia Compressor.
Engine Pulley 96" dia. x 30" face, 200 RPM.
Compressor Pulley 180" dia. x 30" face, 106 RPM.
Pulley centers 18'0".

This Lenix is used in connection with a 400 H. P. Diesel Engine driven ammonia compressor, in a Florida ice plant. The very nature of these large units necessitates a flexible driving medium. The automatic action of the Lenix in adjusting itself to each stroke of the engine and compressor makes it certain that the proper belt tension is maintained in the slack side of the belt. Belt slippage is positively eliminated. Note the large arcs of contact of the belt with the pulleys.

In addition to providing resilient and efficient transmission of power from the engine to the compressor, this Lenix made it possible to install the units on centers of only EIGHTEEN FEET, approximately one-third of that which would be necessary were an efficient and reliable open belt drive installed. The building is now considerably smaller than originally contemplated.

The saving in power and maintenance costs and the increased capacity of the belt effected by the use of the Lenix represent continuous money savings.

The Lenix is the **pioneer** short center belt drive. More than eight thousand Lenixes are now installed in practically every industry on drives ranging from 1 H. P. to 1400 H. P. A number of these Lenixes are still in daily service after more than twenty years of operation. This is proof of the reliability and the soundness of design and construction of the Lenix. Our experience, the result of twenty-one years of designing and building Lenix drives, is offered for the solution of your belt drive problems.

A card will bring you full information.

F. L. SMIDTH & CO., Inc.

Engineers

50 Church St., New Yorl Y.

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largement will find such a record his strongest asset.

Innumerable cases of this same kind occur to mind, in which financial assistance was extended by the builders of plant additions on the strength of the company's earning power and the character of the men at the head of it. They are not confined to those in any one industry or to the big corporations, but range from button manufacturers to proprietors of service stations. In nearly every instance in which this class of intangible security was accepted as satisfactory the obligations were not only met, but the date of maturity was actually anticipated. The reason, it seems, is obvious enough. These men felt that by borrowing money on second mortgage and applying it to the purchase of productive manufacturing equipment, they could earn enough during the life of the mortgage to pay it off at maturity. Almost invariably this proved to be the case.

With the foregoing in mind, the manufacturer who contemplates enlarging his plant and who is able to meet the requirements outlined, will find himself able to negotiate a loan of from ten to thirty per cent. of the cost of his new building, according to the completeness of the tangible and intangible security he has to offer.

How to Choose the Right Kind of Short-Center Drive

(*Continued from page* 22)

considered as a cure-all for all short-center driving problems. The fact that this drive will not slip eliminates it from certain classes of work because at times many dollars are saved by the break-pin action of a flat belt.

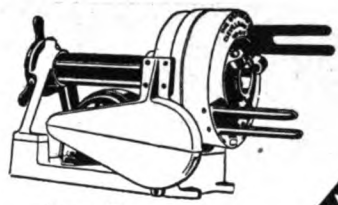
There are many instances in industry where engineers are confronted with ratios ranging from 15 to 1 to 30 to 1. Coping with such reductions by counter and jack shafting may be out of the question. Worm gear or spur gear reduction units may be too rigid. To meet such requirements, a device of foreign origin (Figs. 6 and 7) has recently been introduced into this country. The two short-center driving methods cited above cannot cope with the high ratios such as mentioned. This new power transmission device may go a long way toward solving the problem of a compact, flexible, short-center and high-ratio drive because it utilizes a principle of mechanics that has not been considered for direct power transmission. It is composed of a gear, pinion, pulley, spindle and fulcrum arm. The pulley and pinion are keyed to the spindle which is supported by the fulcrum arm centered on the shaft to be driven. The gear is keyed on the shaft to be driven and meshes with the pinion on the spindle. Thus in the rotation of the spindle by the aid of a belt drive to the spindle pulley, the pinion tends to make an epicyclic movement around the gear wheel with which it meshes, but such movement is restrained when the belt has been tensioned and the continued rotation of the pinion will rotate the gear wheel and operate the apparatus or line-shaft. The degree of tension on the driving belt depends upon the inertia to be overcome in starting the load and in the continued running so that the belt always retains the correct tension for the power requirements. This method of driving is unique from many angles but its chief feature is the absolute automatic load tension on the ordinary open driving belt without the aid of spring or weight con

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Do you still figure your pipe-threading costs on the same basis as 3 years ago? If you do, you are penalizing yourself, because the past three years have seen radical changes in pipe-threading practice—changes which can put dollars in your pocket. The Oster catalog will show you how.



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In eleven sizes for pipe from ¼" to 8".



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Quickly and easily moved—runs from a light socket—in two sizes for ¼" to 4"—with auxiliary drive up to 12".



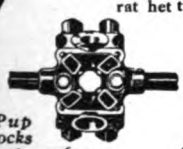
Light Hand Machine
Three sizes—for ¼" to 6" pipe.



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In 15 sizes for pipe from ⅛" to 5"—plain or rat het type.



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Four sizes—for ⅛" to 1" pipe.
Also pipe vises, cutting tools and special dies.

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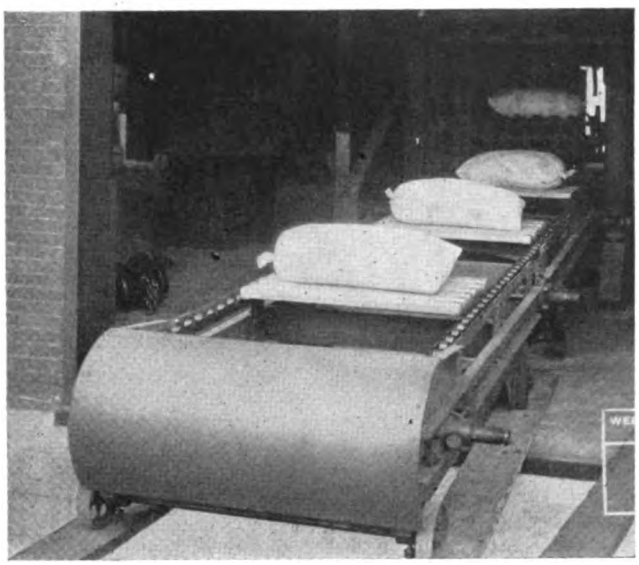
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Helps to Reduce Overhead



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trolled idler pulleys and furthermore the centers of the belt drive appear to be of no consequence to the efficiency of the mechanism. Based on this feature the belt is always in correct tension because the load controls it.

That the regular flat transmission belt manufacturers have been awake to the increasing demand of industrial operations in the line of mechanical power transmission is demonstrated by the fact that in the past year there has appeared on the market a power belt of unusual construction. It is of French origin and its design is based on two of the chief essentials of efficient belt transmission, namely; maximum frictional pulley grip and maximum tensile strength. Therefore, in the combination of these two factors this belt has proven successful to a degree on drives of short-centers.

This type of transmission belt is composed of soft chrome tanned leather strips spaced at intervals across the width of a leather on composition backing and running longitudinally with it. The strips are secured to this backing by hollow countersunk copper rivets, the flat round head of which appears on the outside of the backing which in reality is the belt proper or the tensile strength factor of the medium. The chrome strips, which contact the pulleys give an exceptional friction grip to this belt and the backing, furnishes the pulling strength. This high friction quality enables this type to give good results on short-center driving because its cohesiveness eliminates the tight belt feature of the ordinary short-center drive.

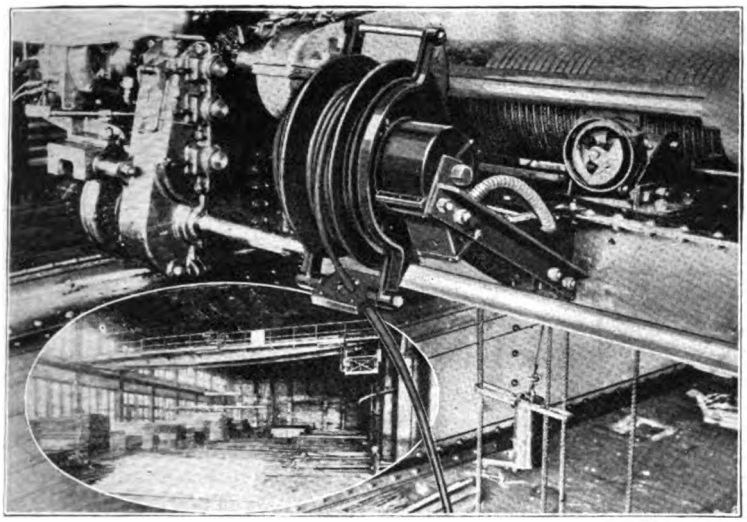
Fig. 10 serves as an illustration of the possibilities of this type on short-center work. This is a 20 hp installation on a 46" center with a ratio of 3¼ to 1—an exceptional center for a flat belt transmitting 20 hp.

Fig. 11 shows a 150 hp. installation of this type of belt on an 11′ 6″ center, demonstrating its possibilities on short-center high-powered drives such as generator and engine work or other similar applications.

The transmission of power by steel chains has advanced to a great extent during the past few years because of the growing demand for short-center compact driving. Engineering skill and industrial demand have developed this type of transmission to such an extent that it is now made in sizes capable of delivering from ¼ hp to 5,000 hp. with a sustained efficiency of 98.5%. The method of connecting prime mover with shaft or machine is positive. There is no slip and no excessive pressure on bearings. The speed is constant from driver to driven because the silent chain drive is in reality a continuous gear connection. It is not, however, suitable for high ratios or excessive speeds in feet per minute. Ratios of 5 or 6 to 1 and speeds of 2,500 r.p.m. should not be exceeded. For economical operation this medium of transmission should have continuous lubrication because it is entirely composed of moving metallic parts. Manufacturers of silent power chains provide for continuous lubrication by furnishing oil tight steel casings for the drive, thus allowing the chain to operate in a bath of oil at all times.



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Constant Duty Reelite with Ball Ring Cable Outlet as used on Milwaukee Electric Crane at plant of Walworth Mfg. Company, Chicago, Ill.

Reelites care for electric cable automatically —no man needed

Where a man has been employed to tend cable, he can be released for other duty. Reelites pay out and retrieve cable far more carefully and reliably than a human being could do the job.

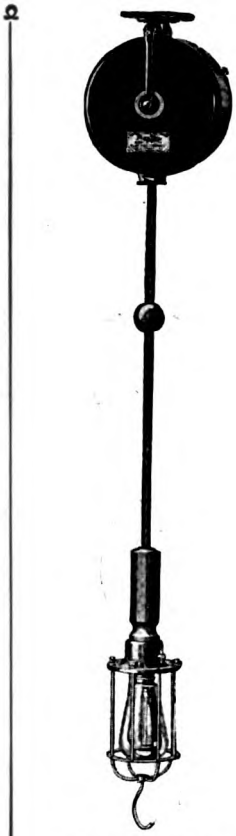
On travelling cranes, lifting magnets, portable hoists—anywhere!—Reelites feed current to moving machinery with absolute efficiency.

And the electrical conductor used is safe—rubber covered cable—thus eliminating bare wires or rails with their constant menace to employees.

In cable-renewals alone, Reelites often save their cost in a year. For there's very little wear and tear—no cable lying around in the grease and dirt, to be run over by trucks, caught on machinery, cut by sharp heels and tools.

Reelites pay out just enough cable for the job—never too little, never too much—and when slack occurs, retrieve it on the instant.

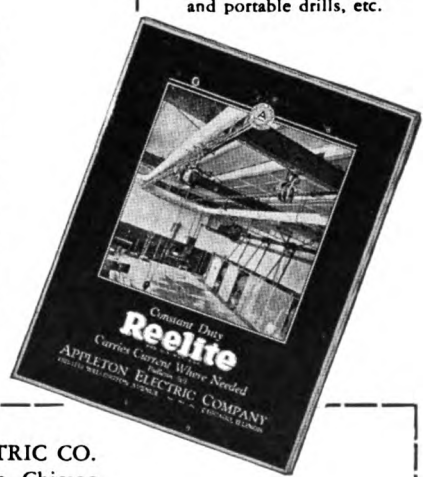
Recently we have published an unusually interesting and complete bulletin on all types of Reelites. The coupon will bring you a copy by return mail —no obligation, of course.



Reelite

REG. U. S. PAT. OFF.

The handy light on a reel
For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connector in place of light so that it will furnish current for small machinery, and portable drills, etc.



APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue, Chicago, U. S. A.*
New York—150 Varick St. Los Angeles—340 Azusa St.

CONSTANT DUTY
Reelite
REG. U. S. PAT. OFF.
Carries Current Where Needed

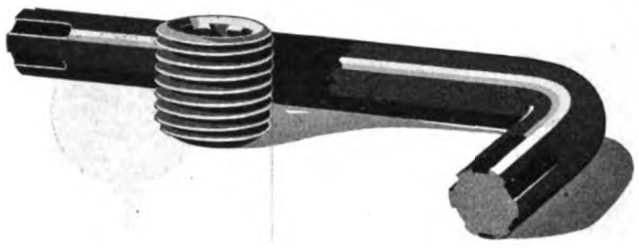
APPLETON ELECTRIC CO.
1716 Wellington Ave., Chicago
Gentlemen:
Please send us a copy of your new Bulletin 501-S.
This obligates me in no way.

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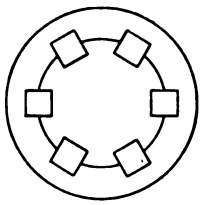
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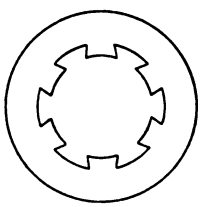
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The holding power of six keys



Imagine a set screw socket and wrench—each with six key seats. What holding power you would have when the wrench and six keys are inserted in the socket! The tightest set would be easy and you would not hesitate to "lean on it" when the job required it.



The Bristo socket design is even more effective than this. Dovetailed flutes are cut in the wrench and socket. They interlock when put together—just like dovetail-shaped key seats, with the keys an integral part of the screw.

The dovetails transmit the power applied to the wrench in the direction the screw is turning. Actually, the tendency is to contract the screw. No trouble with spreading and split sockets, rounded corners and slipping wrenches.

Here is a set screw for *every* job. In your shop it will help you to cut maintenance costs. In your product you can depend upon it to give the utmost in service and you can claim quality in every part.

Bulletin CE-820 describes the Bristo line in detail. Write the Bristol Company, Waterbury, Conn.

This same socket is used in Bristo Socket Head Cap Screws.

BRISTO Safety SET SCREWS

Balance and Control Production to Meet Seasonal Requirements

(*Continued from page 24*)

foundry until the stock is decreased to a reasonable figure, preferably between fifteen and thirty days supply. Until the next inventory is taken, this figure is obtained by adding in the production Condition at the End of Week, and deducting the Assembly Requirements for the following week. This will show whether or not there is sufficient stock on hand to meet the assembly requirements and retain a fifteen days' supply. At the same time, it is a guide for scheduling foundry production for the ensuing week.

Foundry Schedule represents the gross product scheduled for the week and is based on the column Over or Short Total Required; also the condition and capacity of the foundry equipment. This schedule is checked each day to ascertain if the foundry actually produced according to schedule.

Actual Made represents actual pieces made with the foundry loss deducted, and is obtained from the plate casting foundry piece work sheet.

Condition end of each Week represents the condition of the stock at the end of the week. This figure is obtained by adding the total made for the week to the Over or Short Total Required figure but is subject to adjustment depending upon the amount of stock issued. If for any reason the amount issued was below the amount required the difference is added to the condition figure. (In the case of a red figure this will show as a decrease). If the amount issued was in excess of the amount required the overage is deducted from the condition figure. By making these adjustments an accurate figure of the amount of stock on hand is secured at the end of each week. The result obtained from the foregoing is the basis of the computations for the succeeding week which are carried through in the same manner as explained until the next inventory is taken.

Stock Issued represents the pieces delivered to the assembly department. It shows by comparison with column Required for Assembly, if the number of pieces ordered were actually delivered. If by comparison it is found that the order was not completed, it can be included in the delivery schedule for the following week, and delivered to the assembly with the current week's requirements.

The process is continued for a period of thirty days at which time another physical inventory is taken and unfilled orders on hand are deducted. This inventory then constitutes the basis for planning and control for the next period. By taking an actual inventory once a month, all adjustments are automatically made and the danger of carrying errors over a long period is eliminated.

The figures one through fifteen under the caption Short and Over, are used to indicate the condition of stock; that is, whether or not stock is up to the fifteen days requirements. The model condition is to have the signal indicator between the two "ones," which is indicative of a perfect stock on hand.

Each day as production schedules are made out, a reference to only the visible margins of cards is made. Signals falling on the short section are observed and daily production schedules made out from those cards which carry them. In this way, there is hardly a possibility of

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ELECTRICALLY DRIVEN

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GRINDERS
BUFFERS

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UNITED STATES
ELECTRICAL TOOL
· CO ·
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2476 West Sixth Street

Export Sales Representatives—WESTINGHOUSE ELECTRIC INTERNATIONAL CO.—150 Broadway, New York City

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missing an item which is falling behind the production schedule.

A comparison of machines to be utilized for operations and actual production being carried through affords the knowledge of what may be run. Of course, it is not always advisable to change from one operation to another on a particular machine when it will mean an increase in costs. This situation is governed by the foundry superintendent who analyzes the record along with the planning supervisor and lays out production according to the most efficient methods.

The completeness of our procedure which ties up direct with the sales research department is a great asset in helping us to run on schedule throughout the entire year. It is only in the exception that our planned production does not meet the anticipated requirements.

The ideas outlined may be applied to manufacturers of not only seasonable products, but those having a large number of individual parts. It is so easy to overlook and mis-estimate quantities on hand, rather than have an actual knowledge. These conditions mean disaster if continually practiced. Individual knowledge of all production requirements is a logical help to balanced production—there must be harmony.

Reclaiming Valuable Material from Factory Waste

(*Continued from page 26*)

mounted in a similar manner within a revolving cylinder. In the first mentioned design, a series of magnets are mounted on a steel frame placed at the lower end of an inclined revolving screen in such a way that material containing iron is drawn to the side of the screen and lifted up as it revolves. Magnetic material is released when it has passed beyond the magnet and drops into a chute, thus effecting the desired separation. In the second design, magnetic material passing over a drum revolving in the same direction is held against the surface until it is separated from the magnetic material. It is then released and the separation accomplished. Separators of the first mentioned design have been widely applied to iron and steel foundry use for reclaiming iron which formerly was consigned to the dump. It is also used quite generally in connection with rotary screening operations.

Separators of the drum type have recently been developed for the concentration of magnetite iron ore by both the wet and dry process. This separator has a circular magnet of the alternating pole construction. The magnet is made adjustable to within certain fixed limitations and the cylinder is made to revolve about the magnet. The ore treated is crushed to a size varying from approximately ¾-in. mesh to fines. This separator is equipped with a feeding hopper which distributes the material onto the cylinder. The alternating pole construction of the magnet materially assists in effecting high concentration in that the material in passing from pole to pole of the magnet is agitated and turned over and over. By agitating the material the gangue matter or non-magnetic material is shaken out, while the magnetic material is held against the face of the cylinder until it passes out of the magnetic field, when it is automatically discharged. A machine having a magnet of alternating pole construction with additional featu-

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Are you driving tacks with a sledge hammer



A sledge does the work—but slows up the job. Similarly—in your ½" Portable Drills, the ideal speed for ½" drilling is far too slow for the smaller size drill bits which you use so often. For higher drilling efficiency use



The Cincinnati

2-speed Electric Drill

Gear shift lever shifts speed instantly from low to high or back again.

You can't beat Type UD when it comes to getting the proper drilling speed of small twist drills. A day's work will show you why. ***Ask your jobber's salesman—today.***

THE CINCINNATI ELECTRICAL TOOL COMPANY

2685 Madison Road **Cincinnati, Ohio.**

PRESSED METAL PARTS

are rapidly proving their superiority for their adaptability; replacing wood parts and iron castings.

The savings effected through the elimination of shrinkage, labor attendant in making parts to fit, plus freight bills are expense items worth considering.

Send us blue print or pencil sketch and our engineers will help you to reduce your costs.



We specialize in Guards of every description.

THE BREESE BROS. CO., Cincinnati, Ohio

FABRICATORS OF

Steel, Iron, Brass, Copper, Monel Metal--Requiring Stamping, Forming, Drawing, Blanking, Punching

See Data A. S. M. E. Condensed Catalogue of Mechanical Equipment, also Chemical Engineering, McRae-Hendricks, and Thomas Catalogues.

30 to 40% MORE AIR AND LIGHT



Light and Air Without Glare

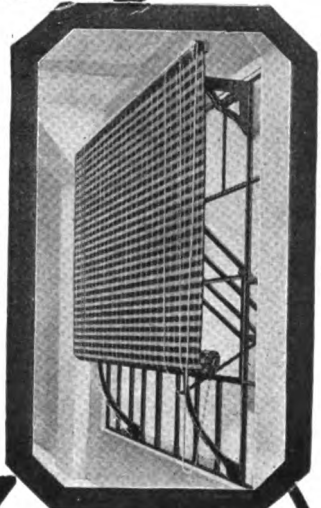
Good light and air—the two essentials of worker efficiency—are insured with the installation of RATOX SHADES. They admit from 30% to 40% more light and air than ordinary shades.

The illustration at the right shows installation made where center-swung ventilators are used. Other methods have been developed for all types of steel, hollow metal and wood sashes.

Constructed of basswood strips woven parallel with hard twist seine twine RATOX SHADES give satisfactory service for twenty years or longer.

Send specification for prices and complete information.

Hough Shade Corporation
Industrial Division
136 No. LaSalle St. Chicago, Ill.

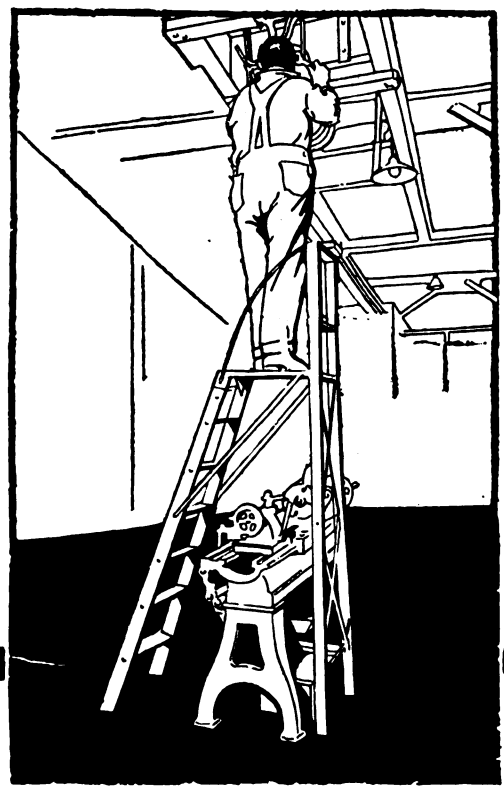


RA-TOX
OFFSET WOOD FABRIC SHADES FOR STEEL SASH

Center-Swung Ventilators
Guided around center-swung ventilators, Ratox Shades are brought back flush with the wall at base out of the way of men and machinery.

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DAYTON
Safety Ladder



No lost time on this ladder

There's no slowing up of the work where a ladder must be used, if you provide your men with the Dayton Safety Ladder.

Made of steel-braced aeroplane spruce, with wide leg-spread, the Dayton Safety Ladder cannot tip, sway, wabble, slide, or collapse. On its wide platform workmen feel absolutely sure of themselves, work with both hands, get close to their work without constant moving of ladder, have tools and equipment within easy reach.

Many users find the Dayton Ladder saves 30% of a workman's time. Equip with the Dayton, and cut labor costs, reduce accidents, in your plant. Made in sizes, 3 to 16 feet.

Write Dept. I. I. 7 for complete information

The Dayton Safety Ladder Co.
121-1[illegible] Third St., Cincinnati, O.

which permit of jigging the ore is used when this ore is treated by the wet process. The ore is ground considerably finer and is spread onto the moving conveyor, the conveyor having raised edges forming a trough. One or more sprays are used and a quantity of water is made to pass through the ore. The ore is moved backward and forward crosswise of the moving conveyor and as the ore passes from pole to pole of the magnet, it is turned over and over allowing the water to wash free from the ore all gangue matter. This gangue matter moves in a downward direction, while the trough conveyor moves in an upward direction carrying the magnetite over the top of the machine and into a receiving hopper.

One of the most common uses of magnetic belt separators is in the recovery of brass and copper from machine shop turnings. In a large eastern plant manufacturing small electric motors, a special machine of this type is paying dividends every day. It consists of two short, inclined rubber belts having magnetic head pulleys, one conveyor being mounted over the other. The whole apparatus is mounted on a structural steel frame carried on ball bearing casters to permit ease of movement over the floor. Material received on the upper belt is partly cleared of iron waste by the first magnetic pulley. The non-magnetic portion is discharged into a suitable receptacle and the iron flows through a chute to the lower belt. The remaining iron is cleared by the second magnet pulley, which also discharges non-magnetic particles into the bin. Where 100 per cent. separation is necessary, as in the case of iron and brass, it is necessary to make use of the double separation unit. The device referred to, recovers about 200 lbs. of brass daily, with an average value of $25.

An unusual application of a magnetic separator using a very wide belt is in one of the sorting yards of a foundry and manufacturing company in the vicinity of Los Angeles, Calif. This is a single pulley unit used for removing tin cans and similar metallic articles from the waste products, thereby saving the labor of five men in exceedingly disagreeable work.

New Lo-Hed Electric Hoist

THIS will announce a new Lo-Hed electric hoist that can be mounted in a fixed position, either overhead or on the ground, or can be placed on skids as a portable hoist for contractors' work, derricks, as a car puller, mine hoist, elevator work, ash handling, coal tipples, loading booms, pulling loads up inclines, furnace door lifting, handling spouts in steel mills, handling carcasses in slaughter houses and in general all sorts of lifting and hauling that can be done with a hoist in a fixed position.

The standard machine consists of a smooth drum lubricated by splash from the gears and alemite fittings, driven by a motor through a train of spur gears, all mounted on a common bedplate. It is furnished in sizes for handling loads from 500 to 4,500 pounds.

Motor and gears are completely enclosed. Gears are of drop forged steel, heat treated and run in an oil bath. "High duty" roller bearings are mounted on the ends of all gear shafts. The cover of the gear case is easily removable.

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Concrete Floors Made Granite-Hard

THE concrete floors of this great new Power Plant at Sterlington, La., might as well be flint, as far as wear and dust are concerned. They have been made permanently hard and dust-proof by treatment with Lapidolith.

Leading architects and builders have been using Lapidolith for 15 years. It is a liquid, chemical compound that penetrates the porous cement and binds the loose particles together into a fine, granite-like surface that resists wear for a lifetime.

LAPIDOLITH
TRADE MARK

We can refer you to buildings in your city that are still in perfect condition after being treated with Lapidolith years ago. Go and look at them. We are prepared to apply Lapidolith anywhere, through our own service crew, and we guarantee satisfaction to you and your clients. Send coupon below for free samples and literature.

L. SONNEBORN SONS, Inc.
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SONNEBORN LIFE SAVERS for BUILDINGS

Other Sonneborn Products

LIGNOPHOL
Wood Floor Preserver and Hardener

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Washable Enamel Paint

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Rainproofs Buildings

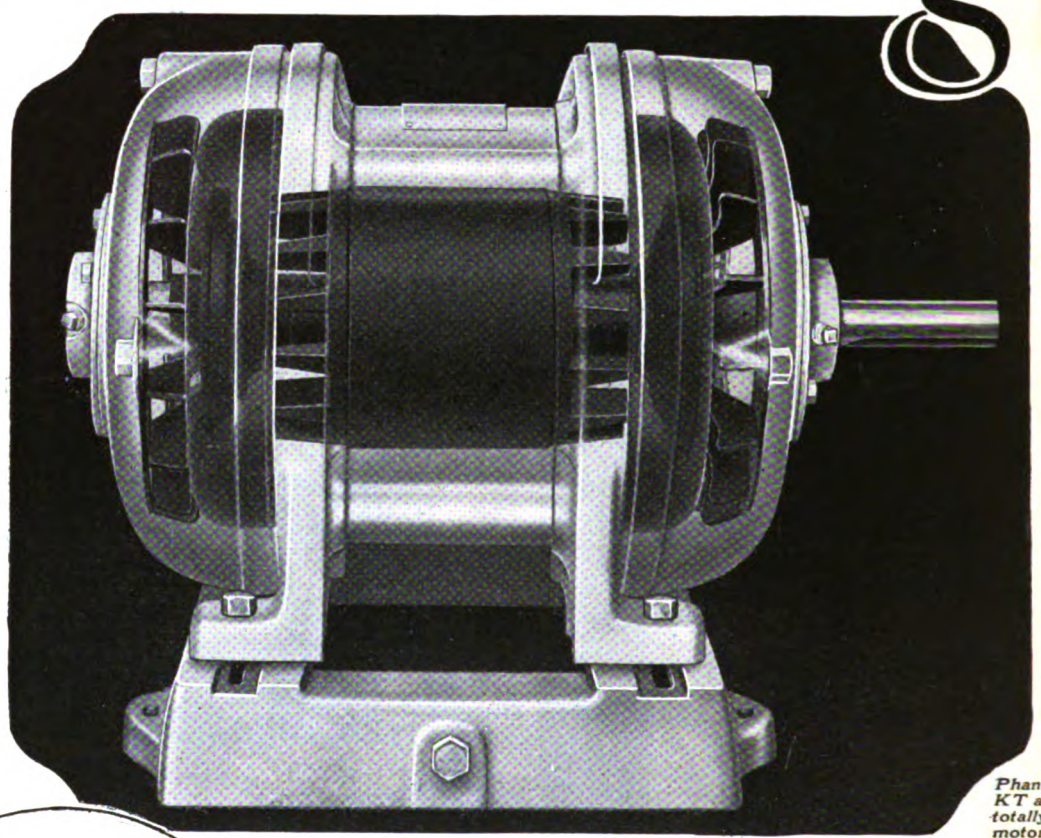


Power plant of Louisiana Power & Light Co., at Sterlington, La., Ford, Bacon & Davis, Engineers, Lapidolith used on all concrete floors.

L. SONNEBORN SONS, Inc., 114 Fifth Avenue, New York
Please send me, without obligation, demonstration samples and literature on: ☐ Lapidolith ☐ Lignophol ☐ Cemcoat ☐ Hydrocide Colorless ☐ (Check products that interest you.)
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Announcing



Phantom view KT and KQ "9 totally enclosed, motors.

Apply the proper G-E motor and the correct G-E controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. Built in or otherwise connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.



Types KT and KQ "900 Series" totally enclosed, fan-cooled motors. Sizes 2 to 15-h.p. inclusive

Motorized Power
—fitted to every need

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

advertised in this issue write Industry Illustrated

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A Complete New Line of Totally Enclosed, Fan-cooled Motors

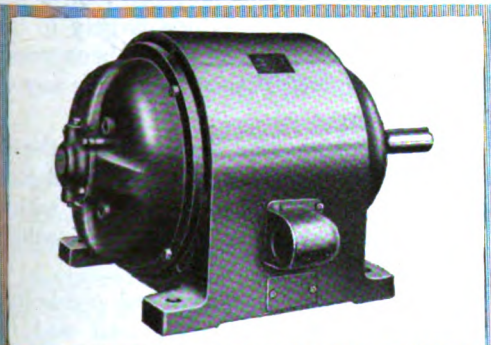
Types KT and KQ—Polyphase

Type CD — Direct current

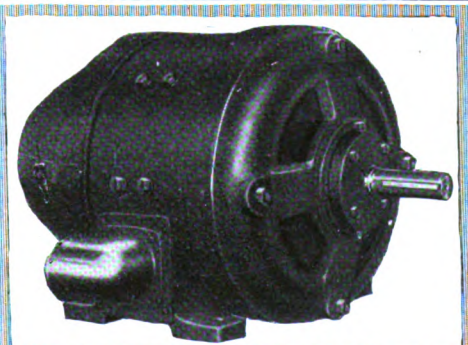
In the development of the new lines of totally enclosed fan-cooled motors, greater output per pound of material has been obtained than is possible by other methods of total enclosure.

The result is a reduction in first cost, greater economy in operation, and virtual interchangeability with open motors of corresponding ratings.

Totally enclosed fan-cooled motors are equipped with ball bearings.



Types KT and KQ "500 Series" totally enclosed, fan-cooled motors. Sizes 20 h.p. and larger.



Type CD totally enclosed, fan-cooled motor. Sizes 2 to 21½-h.p. inclusive.

201-100

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SALES OFFICES IN PRINCIPAL CITIES

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Only 5 cents for repairs in 2 years—



Made of Northern Hardwood

on this "GLOBE" Factory Truck

In one installation of GLOBE Trucks, the repairs in two years only cost $0.05 for the entire period.

In many instances, the repair costs over two years are never more than 1% of the cost of the truck.

That is why so many industrial plants now buy GLOBE Trucks only. Then and then only can they be assured of trucks that are "Built Stronger to Last Longer."

GLOBE Trucks have been in use over 25 years, during which time we have gained friends in every industry.

You can choose from 16 styles in Wood and Steel adaptable to all industries.

Get GLOBE facts; they will interest you.

Sample truck on request.

Jobbers carry GLOBE Trucks. If not write us direct.

GLOBE TRUCKS

Globe Vise & Truck Co.

Grand P Michigan

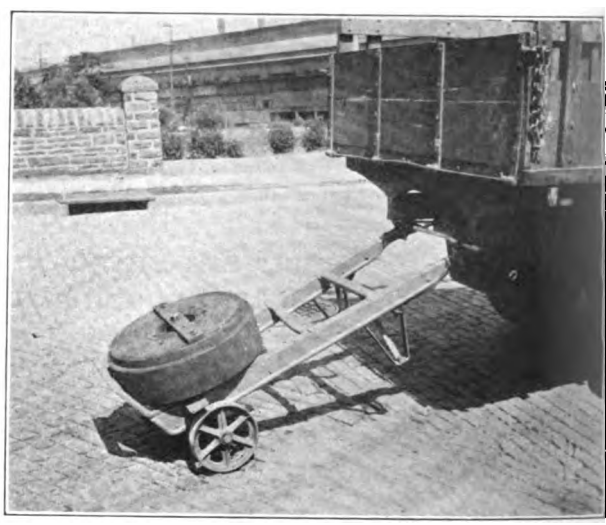
Materials Handling

Hand Truck Survives Rigid Test

THE illustration shows one of a number of severe tests to which an entirely new type of two-wheel pressed steel hand truck was subjected by the maker before being put on the market.

Loaded with 750 pounds, one of these pressed steel hand trucks was towed back and forth over a street paved with granite blocks and broken brick for a total of ten miles, bounding over chuck holes, ridges and bumps while the speedometer registered five miles an hour.

The truck withstood this abuse and was as good as ever when the test was over. And if this does not seem like a severe test, try it with an ordinary truck.



The steel truck weighs no more than a wooden truck of the same type and size, due largely to the fact that while made of pressed steel, it has been possible to keep it light and in perfect balance without in any way sacrificing strength.

This has been accomplished through the use of parts specially shaped to give great rigidity and strength. Corrugation and shaping have been used with remarkable skill to increase the strength and serviceability of these trucks.

It is the claim of the maker that loose bolts, splintering and cracking are entirely eliminated and further, that quick and easy replacement can be made, of parts injured by accident.

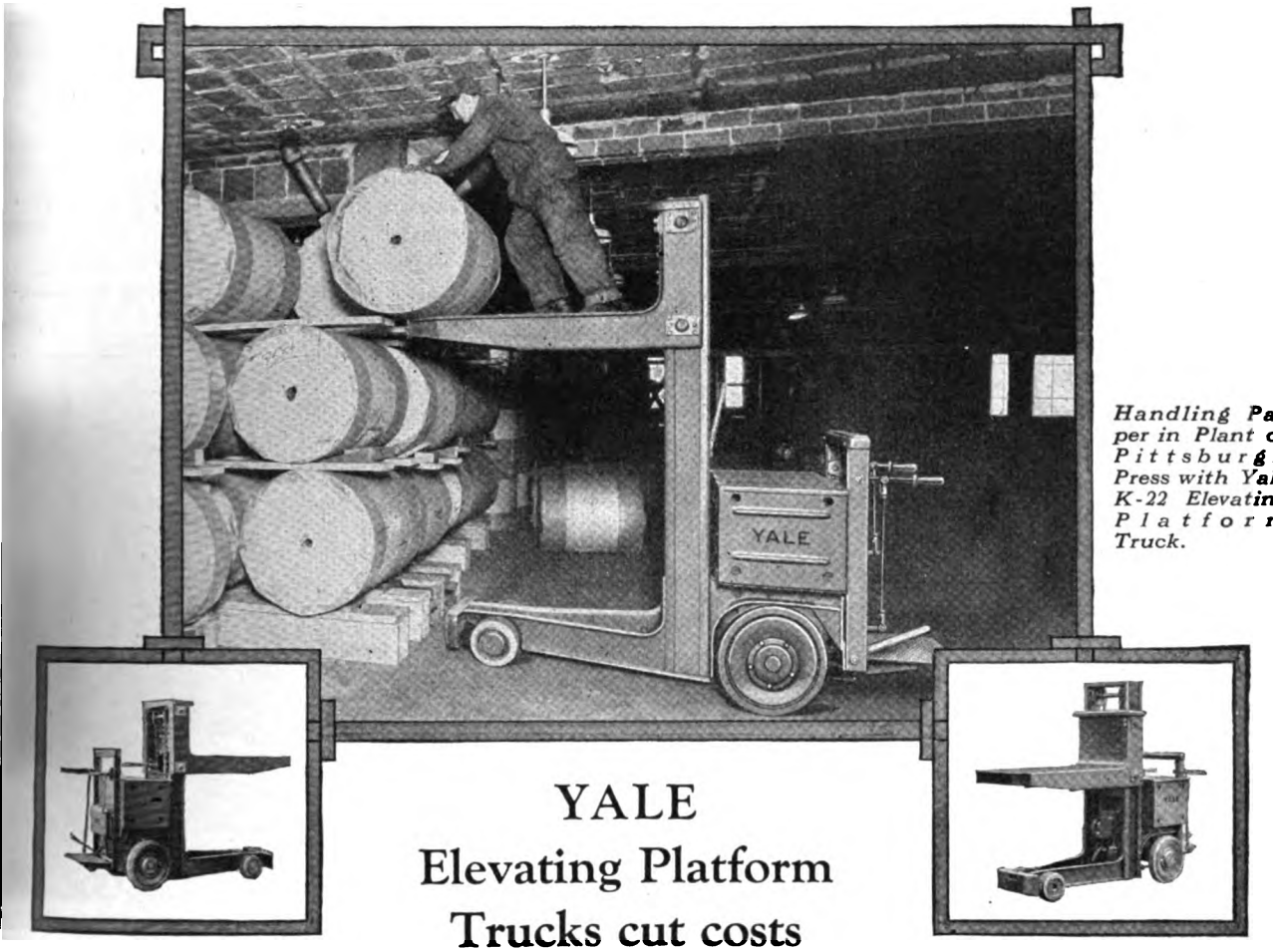
Portable Loader and Unloader Cuts Time and Labor

THE illustrations show a new development in monorail conveying equipment which is stated to be effecting remarkable economies in loading and unloading materials from box cars. This loader makes all parts of box car accessible with loaded trolleys coming from production department or loading platform.

Hitherto the principal limitation of using monorail for this work has been that it was necessary to stop at the

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TRADE **YALE** MARK



Handling Paper in Plant of Pittsburgh Press with Yale K-22 Elevating Platform Truck.

YALE
Elevating Platform
Trucks cut costs

Are they saving money for you?

In the industry pictured, paper-handling, the whole problem was one of reducing labor costs and damage to product. All the complicated difficulties due to size, weight and shape of material disappeared after the practical installation of Yale K-22 Elevating Platform Trucks.

Yale has reduced friction in its spur-geared drive and hoist units to such an extent that it will deliver the greatest amount of work from the truck battery. Steering friction has been reduced by mounting the steering knuckle king pins on eight roller bearings. Reduction in friction minimizes wear, the fundamental cause of maintenance troubles.

The flexibility in operation of all Yale Trucks, together with the short turning radius, makes it possible to negotiate narrow aisles and congested areas quickly and safely.

They will lift a 2 to 3-ton load at a speed of 10 feet per minute to a maximum height of 10½ feet if required. Many Yale installations are making savings where truck operation was formerly considered impracticable.

The Yale & Towne Mfg. Co., *Stamford, Conn., U.S.A.*

YALE MARKED IS YALE MADE

Hoisting and Conveying Systems

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For Quick Hoisting Use the ROEPER Electric Hoists

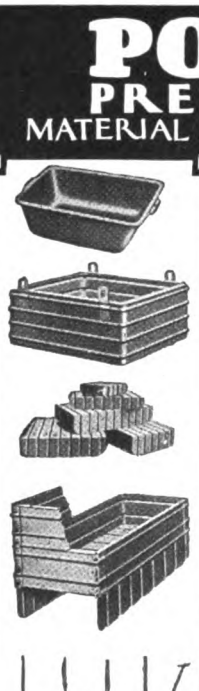
Made in a variety of types to meet most every requirement.

State your need and we will send you description and quote you prices.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys

POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



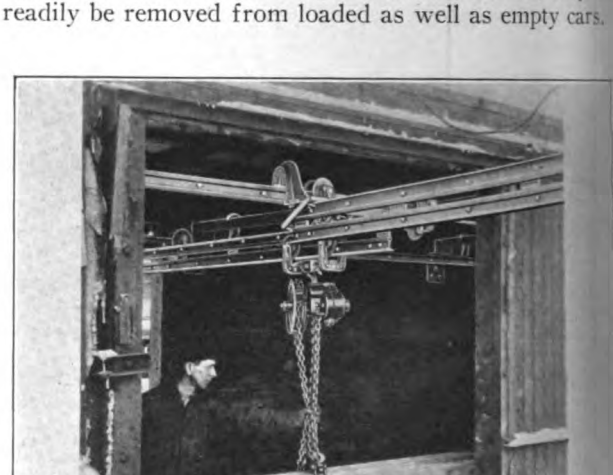
THE salvation of profits in plants both large and small is coming more and more thru reduced handling costs. POWELL Platforms and other pressed steel Material Handling equipment enjoy an exceptional reputation for service and economy. They handle heaviest loads, save time and labor and promote increased efficiency wherever introduced. You will be interested in our free literature, illustrating the entire POWELL line.

The **POWELL**
PRESSED STEEL CO.
HUBB
Suburb

car door and that it was not possible to unload directly from the monorail into any part of the car.

With this loader, the loaded trolley can be brought from production departments or loading platforms and the load deposited at any point on the floor of the box car. It is claimed this will greatly broaden the application of monorail conveying systems and that present installations can be extended to include the box car loader and add to savings effected.

The equipment shown can be fitted up in any box car in fifteen minutes or less. Two men can assemble it ready for use and it can be dismantled and removed from the car in less than five minutes. No permanent extra fittings are required in the car and since all parts of the equipment are suspended up near the car roof, they can readily be removed from loaded as well as empty cars.



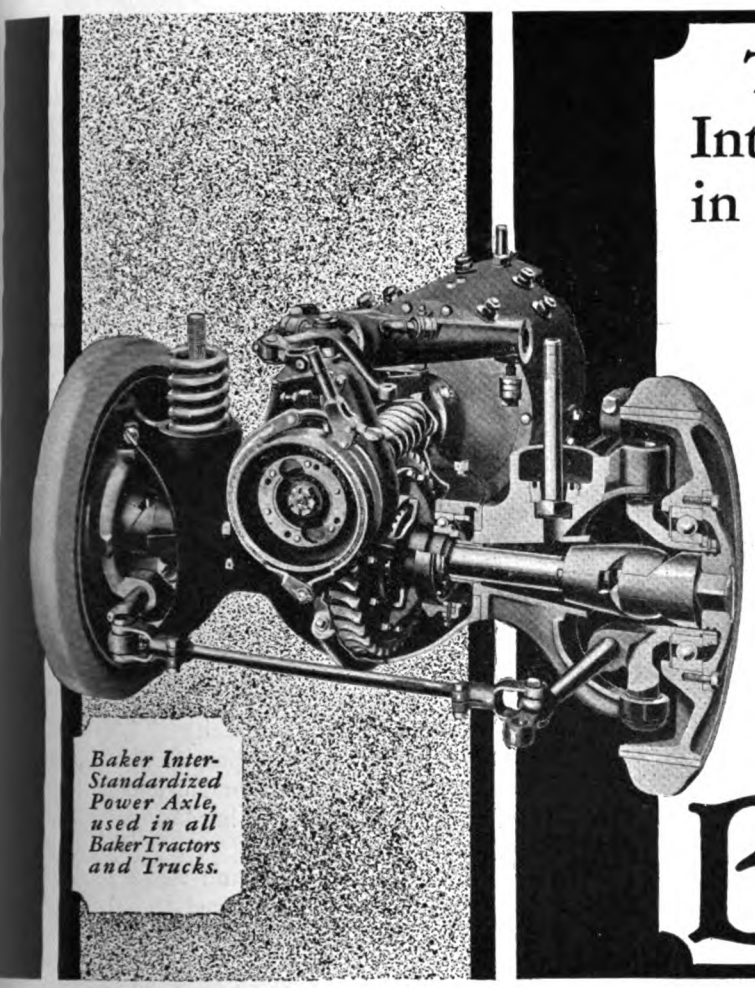
Above: The trolley travels from the loading platform to the box-car on a monorail. Below: The section of the monorail inside the car acts as a transfer crane.



To prepare the box car to receive the unloader, a series of steel brackets, with an offset bend toward the upper end and provided with slotted holes at the lower end, are nailed up along the sides of the interior of the car. In the upper slots of these brackets are slipped a series

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Baker Inter-Standardized Power Axle, used in all Baker Tractors and Trucks.

The Economy of Inter-Standardization in Fleet Maintenance

NINETY-eight percent of all vital parts of Baker tractors, trucks and cranes are identical on all models and interchangeable with every other model.

A fleet of these economical machines can thus be maintained with the smallest possible stock of separate parts and with a minimum labor charge.

THE BAKER-RAULANG CO.
2179 West 25th St. · Cleveland, Ohio

ELECTRIC TRACTORS AND TRUCKS

TRADE-MARK REG. U.S. PAT. OFF.

Baker

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street



"..... reduce our handling costs enormously"

That's what one internationally known firm wrote us after they had installed PLIMPTRUCKS.

The wheels are directly under the load at all times, consequently the loads cannot tip or sway.

There are 14 exclusive advantages that make this truck standard equipment in the largest plants.

Hyatt Roller Bearings make them free rolling and increase their capacity.

C. A. GRAHAM

National Distributor

170 BROADWAY, NEW YORK, N. Y.

ESTABLISHED 1912

PLIMPTRUCK

B.E SCRIVEN PATENTS

STABLE AS THE PYRAMIDS

The LIFT TRUCK with the Knuckled Steering Wheels

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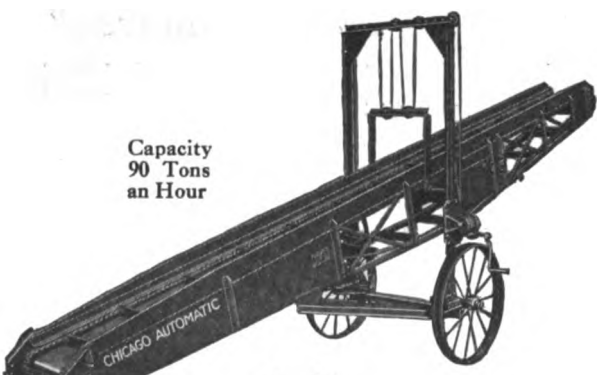
CHICAGO AUTOMATIC

Conveyors and Track Unloaders Made Possible a Ton a Minute Car Unloading



Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use 90 tons an hour is the capacity of both machines

The Model T. U. goes under any car and handles all classes of fuel



This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable c

982 Old Colony Bldg.

Representatives in All Pri

transverse stringers which in turn support the hangers carrying the runway rails for the crane bridge to run on.

The loader itself consists of a short transfer crane assembly operating on two parallel lines of crane runway extending the full length of the car. The crane bridge is carried by special designed trolleys which carry the bridge high-up between the runway rails, thus obtaining maximum headroom clearance.

The standard unloader equipment is constructed to be adjustable for cars 36 to 40 feet in length and the stringers supporting the crane runways are adjustable to correspond to different widths. All parts of the unit are of a size to be readily handled and the work of setting up and removing is easily accomplished.

The box car being spotted opposite the projecting end of the loading platform monorail system, the crane bridge is moved to the car door and placed in alignment with it and latched into place, as shown. The loaded trolley is then run onto the crane bridge, the latch is released and the load moved to the desired point in the car. The releasing of the latch automatically places a safety stop at the free end of the loading platform monorail to prevent the possibility of any following trolley from running off the track.

This box car loader has a capacity of 4,000 lbs., and is made entirely out of steel shapes, steel rails, and steel brackets and these will withstand dropping on the car floor and almost any amount of hard usage without being damaged.

To dismantle the unloader and make ready for the next car job, the crane is removed and the supporting stringers lifted out of the side brackets. The brackets that are nailed to the side of the car through key-hole sockets, are then disengaged and removed, the nails being the only things that are left in the car.

The cost of handling the engine blocks shown in the photo of the car interior has been materially reduced by the use of the loader.

A Portable Loader for Bulk Materials

A NEW departure in machines for loading bulk materials into box cars uses a modification of the high velocity belt principle in such a manner that the apparatus is not much larger than a wheelbarrow. It possible, however, with this device to enter the car and turn the machine around so as to deliver to either end as required.

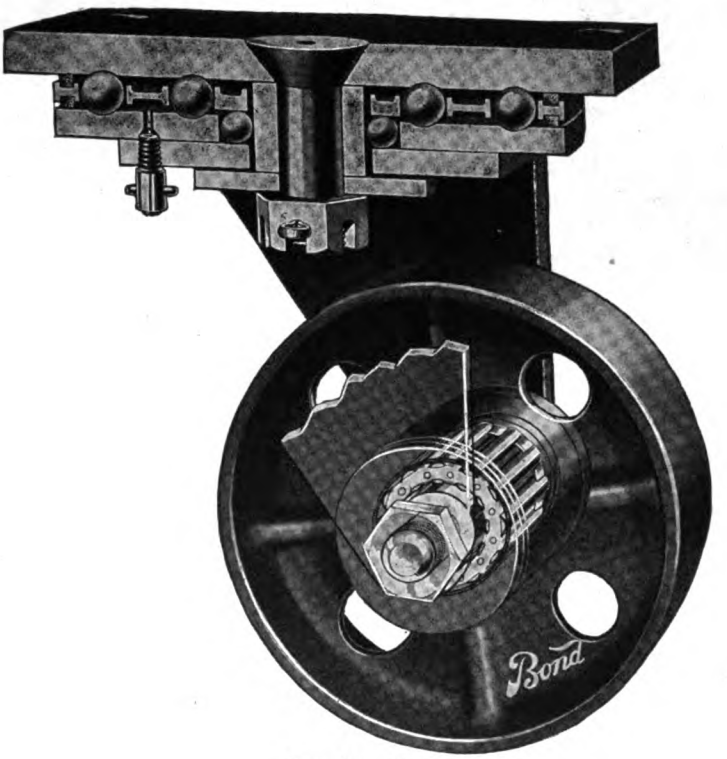
This new form of conveyor obtains proper loading and discharge of the belt in less than three feet by causing the carrying side to travel in an arc of a circle Centrifugal force then produces increased friction between the belt and material which permits the short belt used.

Proper loading also affects the ability to receive material on a high speed belt. The loading hopper is designed that the material travels downward in the same direction as the belt. Being pressed against the belt the material does not lose momentum on reaching the former, and by the time it reaches the discharge point the velocity is sufficient to project the load to the far

[redacted] this issue write Industry Illustrated

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Bond is Best



Pat. App. For

Bond Truck Casters

BOND Ajax Steel Casters have opened up a new field of usefulness for truck casters. They carry loads and withstand shocks that would be disastrous to old-style casters.

All-steel construction and special triple ball race design give this caster a strength never before attained.

If you have heavy-duty caster problems, the Bond Ajax Steel Caster has a definite message for you. Let us send you the facts.

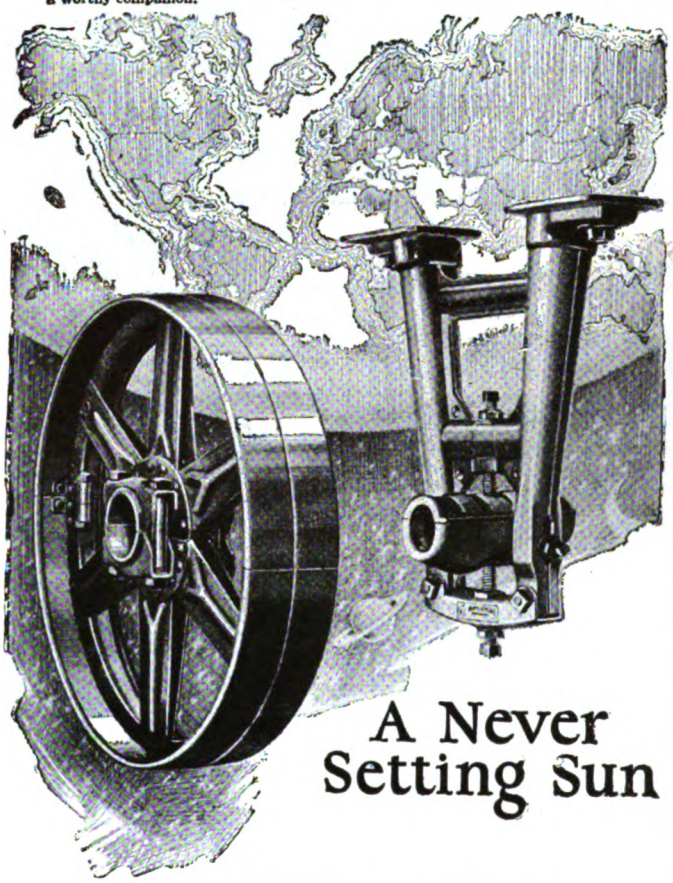
Bond Foundry and Machine Company

Manheim, Pa.
New York Office: 256 Broadway
Philadelphia Office: 617 Arch St.
Chicago Office: 39 S. Clinton St.

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As well designed as is the "American" Pulley — as strong and well made and as efficient in the transmission of power—its younger team-mate, the American Pressed Steel Hanger, is in every feature a worthy companion.

The shaded areas represent those countries of the world where "Americans" are used.



A Never Setting Sun

EAST *or* WEST, southland or iceland, on every continent washed by the seven seas, you will find "American" Pulleys, playing an important part in the economical transmission of power.

In forty-four countries—wherever industry flourishes—"American" Pulleys are used and may be bought from nearby dealer stocks.

If the sun never sets on "American" Steel Split Pulleys, it is because there are definite, recognized advantages in their design and construction.

This is further attested by the fact that more "American" Pulleys are used than any other make of pressed steel pulley.

For additional information consult the nearest "American" dealer (you will find his name and address in MacRae's Blue Book) or write to us.

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks, and Pressed Steel Shapes

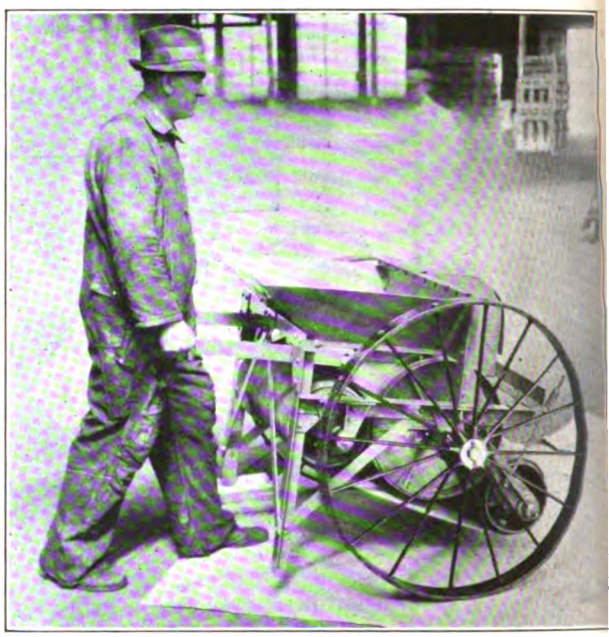
4200 Wissahickon Ave. Philadelphia

AMERICAN

PRESSED STEEL **HANGERS** PATENTED | STEEL SPLIT **PULLEYS** PATENTED

end of a box car. The loader is so made that the angle and height of discharge may be adjusted to suit conditions. The loading point is located about 34 inches from the floor, which is an advantage in operation.

This new form of box car loader consists of a very light steel frame, a belt, pulleys and electric motor drive all carried by large diameter traction wheels. It is equipped with handles and can be wheeled by one man. All journals on the conveyor are equipped with ball bear-



ings, yet the machine is inexpensive in first cost a operation. The capacity of the loader varies from 2 4 cars per hour at a belt speed of 1,800 ft. per min. a is operated by a 2 hp. motor.

Portable Hopper-bottom Car Unload Requires No Pit

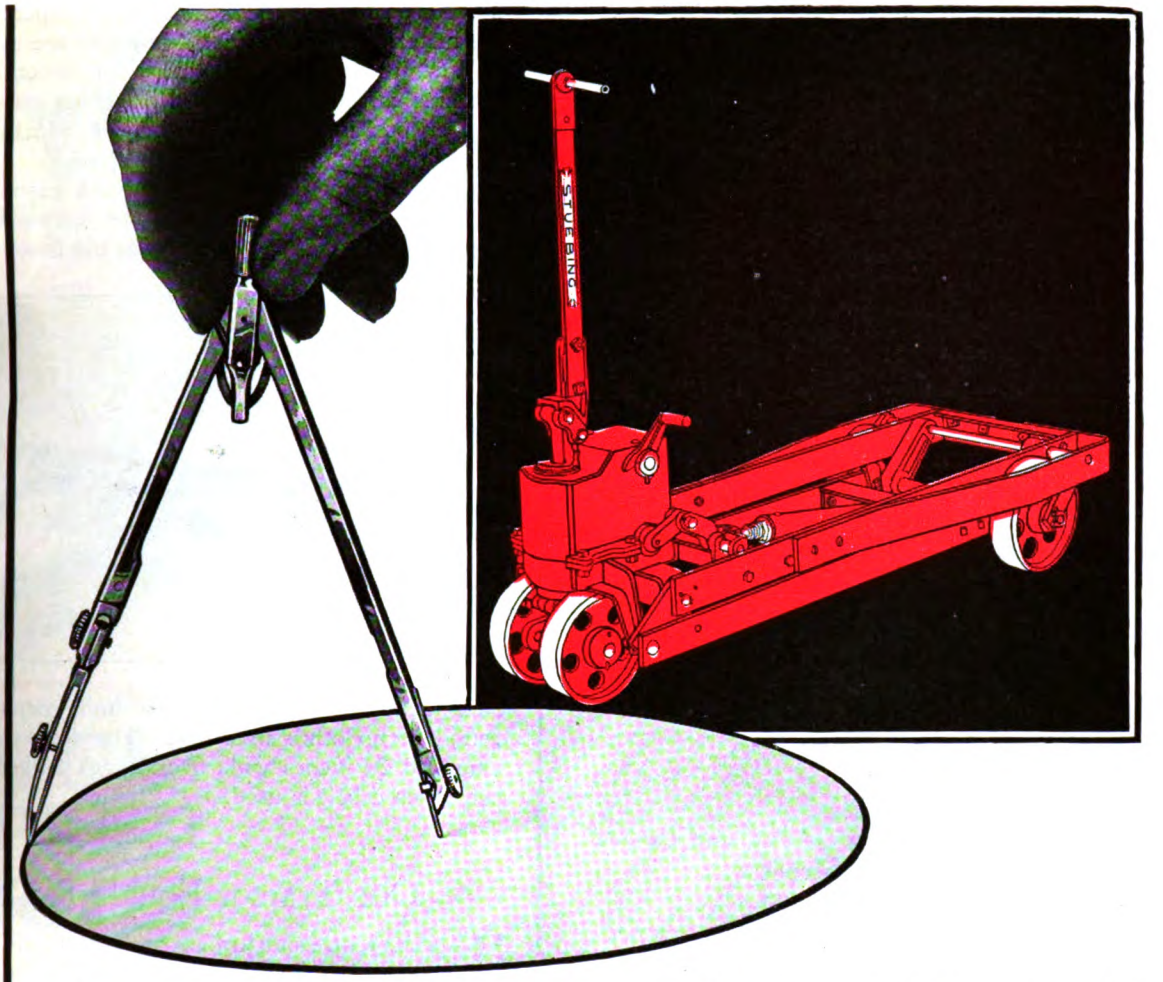
UNLOADING coal, coke, sand, gravel and crus stone from hopper-bottom cars without the use a pit or trestle is the problem successfully met by a n type portable conveyor unit.

It is of a light compact design made possible by use of a specially protected belt instead of the u heavy double strand of chain and scraper flights. breakage of coal handled by this new unit is less tha any other known method of unloading. It is equall successful with large lump coal as it is with the sm sizes.

The conveyor rests over the rails under the hoppe the car. It takes up a space of only 2¾" between bottom of the hopper and the top of the rail. The we of the complete machine is a little over 600 lbs. but motor and other parts are detachable leaving the hea pieces to handle about 450 lbs.

In operation the flow of the material from the c regulated by the hopper opening and by removable c plates over the belt. No other regulation is necessar the conveyor will work when completely buried in m rial and its capacity is governed only by the capaci a secondary unit to which it delivers. As the ma flows out of the car, the removable cover plates ar

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Surround Costs with a 360° Steering and Lifting Range

The only lift truck built that permits a full circle lifting and steering range automatically possesses *other features* of outstanding excellence that result in lower costs. Buying a Stuebing-Cowan multiple lift is to surround your problem with a circle of unequalled quality and savings.

72 for Delco—100 for a large foundry—56 for Chevrolet —indicates the degree of value businesses with unlimited resources for test, place upon this type of Stuebing-Cowan units. Use steering and lifting range as a measure of quality for heavy duty equipment, and you will demand Stuebing-Cowan quality.

Telephone our local branch for demonstration.



Stuebing Steel Bound — Patent Bound — Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble.

The Stuebing-Cowan Co.

Cincinnati, Ohio • • • Holyoke, Mass.

StueBing COWAN

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TENTACULAR
TRANSMISSION BELT

is unrivalled for Fans and Blowers

SIMPLE - ECONOMICAL - EFFICIENT

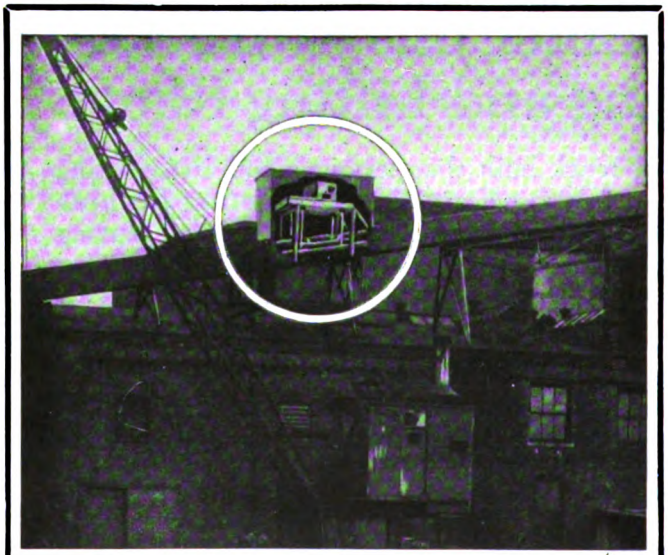
No Special Pulleys required—Idlers eliminated. Ideal for Short Centers and High Pulley ratios. A trial of Tentacular in comparison with any other method of power transmission will convince you in a short time.

Patented all over the world

ALEXANDER BROTHERS, Inc.

Makers and Sole Licensers for U. S. and Canada

18 South Street
Philadelphia, Pa.



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

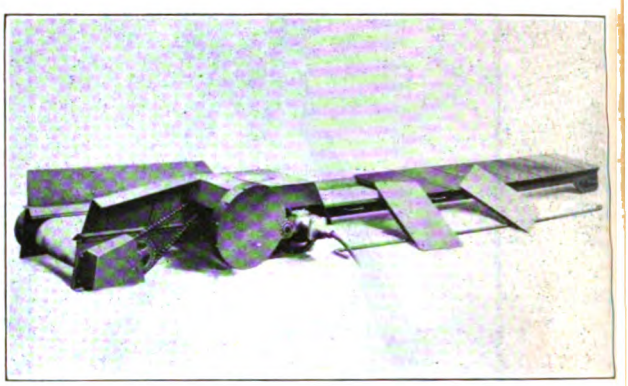
Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.
180 Autumn St. Passaic, N. J.

moved, permitting the conveyor to completely empty all the material from the farthest side of the car hopper.

When unloading from a car having several hoppers the machine can be easily moved along the rails to the next hopper position or the car may be pinched along the track to accomplish the same purpose.

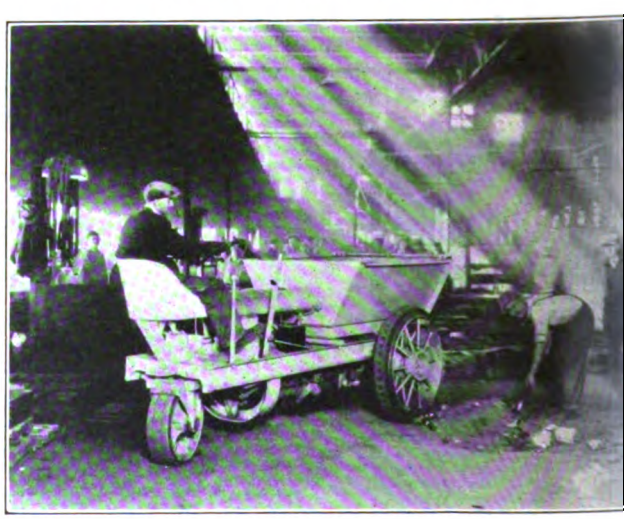
The conveyor is built with either a gasoline engine or an electric motor. The motor or engine is detachable for convenience in handling. The machine may be operated from the ordinary electric light current, a feature found in no other unloader. The conveyor is 13 feet long and 20 inches wide overall. A 16 inch 3 ply rubber covered belt is used.



One Tractor Equals Ten Men

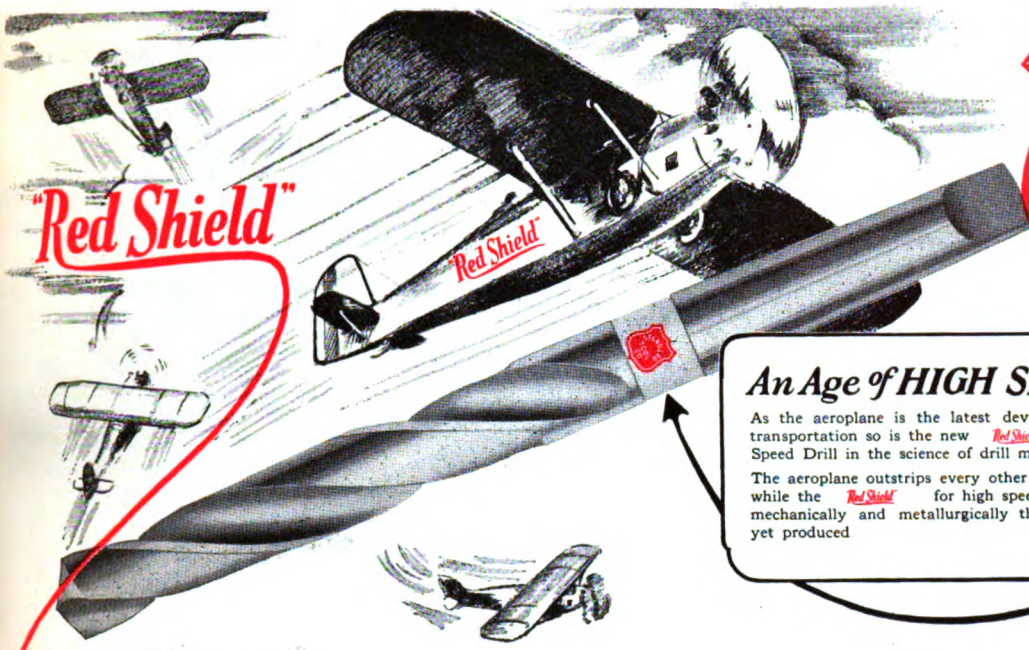
THE picture illustrates one of the functions of a Fordson type truck-tractor in the plant and on the grounds of a malleable and grey iron works.

The company has been using the unit for five months employing it in cleaning up the foundry, removing refuse and burned sand, hauling core sand, taking various materials to the cupola, bringing coal to the annealing ovens and for hauling sand throughout the foundry.



At the present time, the foundry is not running at capacity, so the truck is replacing about eight men; when running at peak capacity, the unit would replace at least ten men, according to the general manager. "Our saving at present is $40 to $50 per day in wages. Not only is this saving considerable, but we find that the work is done quicker and enables us to save time on other work."

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STANDARD TOOL CO.

An Age of HIGH SPEED

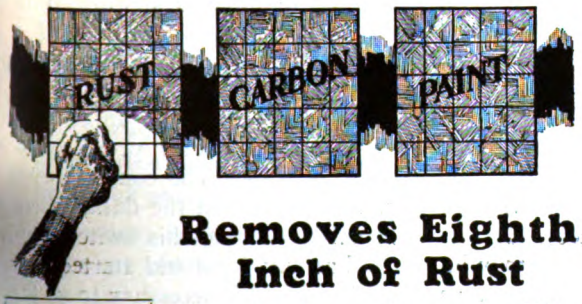
As the aeroplane is the latest development in transportation so is the new Red Shield High Speed Drill in the science of drill making.

The aeroplane outstrips every other conveyance, while the Red Shield for high speed drilling is mechanically and metallurgically the best drill yet produced

HIGH SPEED DRILLS

ALL SIZES
Write for Catalog

THE STANDARD TOOL CO.
CLEVELAND
New York: 94 Reade St. Chicago: 552 W. Washington Blvd.
Fredk. Pollard & Co., Ltd., London and Leicester, England Paris, France—Burton Fils



Removes Eighth Inch of Rust

Does Not Harm Putty Sash or Glass

Try Sunburst Paste on Windows that "Can't Be Cleaned."

Rust one eighth inch thick was removed from the windows of one of the great Detroit foundries by Sunburst Paste. On goes Sunburst—off comes rust, dirt and all deposits without damage to machines or goods from water or acid, since it contains neither. Sunburst cleaned windows have a high luster and stay clean longer—you save labor. Costs less than one cent per sq. ft. of pane. *Send us your order for a barrel, quarter or half barrel*—if it doesn't satisfy you perfectly we will cancel invoice in full.

no acid — SUNBURST WINDOW CLEANING PASTE — no danger

LIQUID WINDOW CLEANERS

If you prefer a liquid cleaner we have it. We also make Thesco Organic Cleaner, Soft-as-Silk Liquid Soap, Hykotar Disinfectant, Hexstercide Insect Killer—everything in Industrial Sanitation.

THE GERSON STEWART CORP.
3541 E. 76th St. Cleveland, Ohio



Why You Should Buy the Best

Because—The New Badger represents the best and latest developments in car movers. Its patented features have made it the most widely used mover on the market. Careful painstaking workmanship and selected quality materials have kept it in that position.

Because—The castings are of certified Malleable, handle of selected Wisconsin Rock Maple, Slip-proof spurs of especially treated steel.

Because—It is warranted for six months service. Sold 30 days trial, no money in advance.

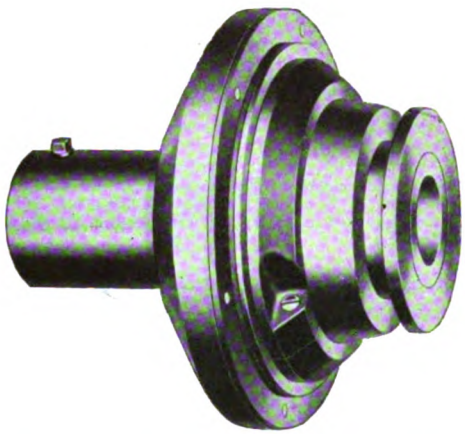
Your jobber has them.

THE ADVANCE CAR MOVER CO.
Appleton, Wis.

New Badger
SLIP PROOF CAR MOVERS

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Smoother Operation Less Space More Power



The NEW CONWAY DISC CLUTCH

Added to the ruggedness, ease of operation and efficiency which have gained for CONWAY CLUTCHES a leading place in industry during more than twenty years. The NEW CONWAY DISC CLUTCH offers an even greater degree of compactness and greater power capacity.

The NEW CONWAY DISC CLUTCH is

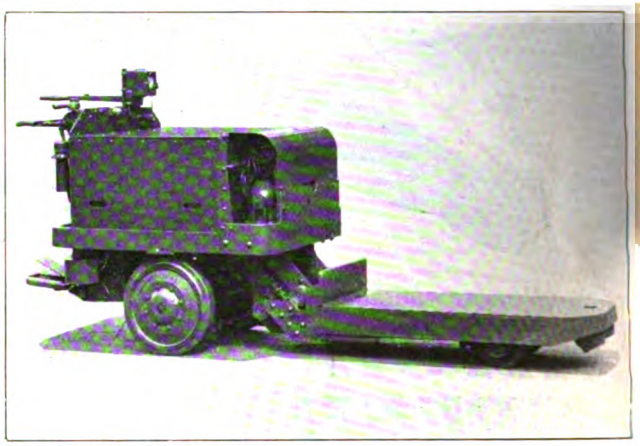
Entirely enclosed,
Inherently Balanced,
Has Under-Slung levers,
Large lever ratio,
Accessible, accurate adjustment,
Drag free idling,
Helped instead of hindered by centrifugal force,
Steel Discs,
Chrome-nickel forged levers,
Full length bearing for loose member.

Where space is limited and the service is unusually severe, it will pay you to install the NEW CONWAY DISC CLUTCH. Write for complete information on this and other Conway Clutches.

THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio

New Elevating Truck with Chain Lift

THE elevating trucks illustrated employ a distinctly new and unique lifting principle. The underside of the platform is fitted with four steel inclines which run against hardened steel rollers pinned to the truck under frame. During the elevating operation the platform is pulled up these four inclines by two roller chains. The platform travels a maximum of 9 inches with a net lift of 6 inches. Two additional rollers operating against the top of the forward inclines prevent the platform from tipping, and insure its remaining parallel with the ground regardless of the distribution of the load.



The lifting unit consists of an enclosed compound wound motor operating through a triple spur gear reduction and a fourth reduction consisting of a double set of planetary gears working in parallel. This motor drives two hardened steel pinions which wind up the two lifting chains.

The limit switch operated by a rack and pinion opens the hoist motor circuit at both limits of travel. An enclosed magnetic disc brake mounted on an extension of the armature shaft brings the motor promptly to rest after the limit switch operates. The control switch for the elevating motor is mounted on the dash, where it is accessible. By manually operating this switch, the hoist motor may be stopped at any point and started up again or reversed as desired. It is not necessary to go through the entire cycle of operations.

This Is Efficiency

AN engineering student, still in the 100 per cent. theory class, was one day allowed to visit a large power station. Desiring to make a favorable impression he inquired of a pleasant faced grimy fellow:

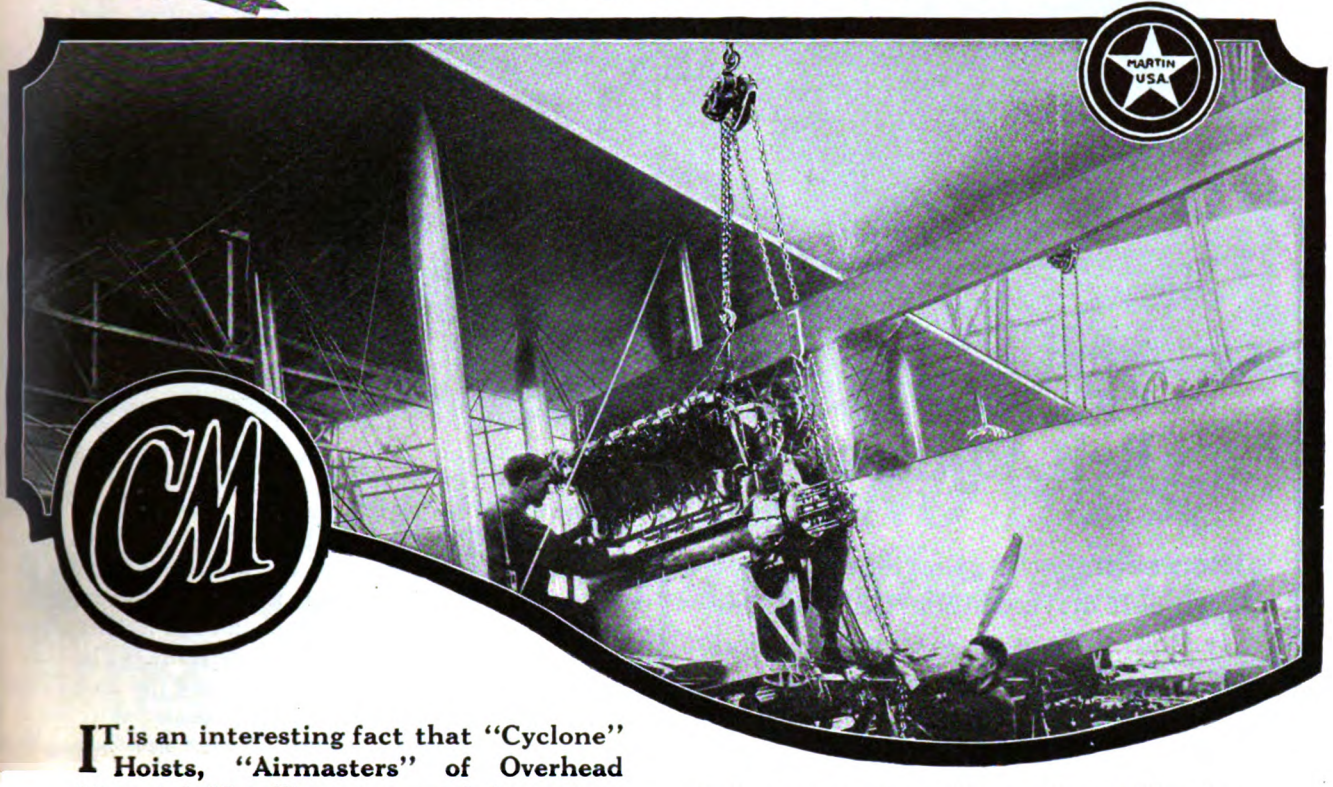
"What is your overall efficiency?"

"Me hoverall hefficiency?" repeated the obliging man "Oi thinks oi wears out a pair of overalls nigh onto ivery three months."

For ... advertised in this issue write Industry Illustrated

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"AIR MASTERS"

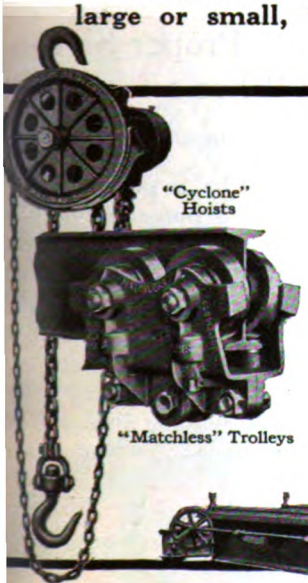


IT is an interesting fact that "Cyclone" Hoists, "Airmasters" of Overhead Material Handling, are used in assembling Glenn Martin Airplanes, "Airmasters" of Overhead Navigation.

Lifting and conveying huge motors and other materials in and about the plant of The Glenn L. Martin Company, Cleveland, Ohio, "Cyclone" Hoists have long since paid their cost of installation in direct savings in labor costs.

In every industry, in every business, large or small, "Cyclone" Hoists and their companions in service—"Matchless" Trolleys — are keeping material handling costs at rock bottom levels.

Let us help you search out the hidden costs of your material handling operations and eliminate the resultant hidden losses. "C-M" Overhead Material Handling Equipment may be the direct means of increasing your profits in less time than could be effected by any other production method.


"Cyclone" Hoists

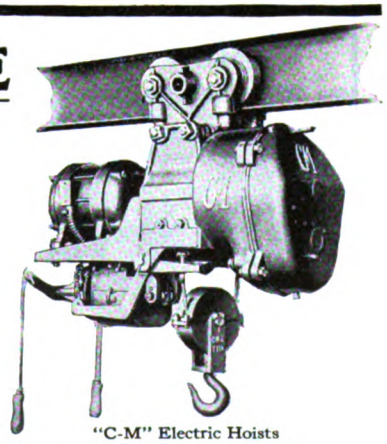
"Matchless" Trolleys

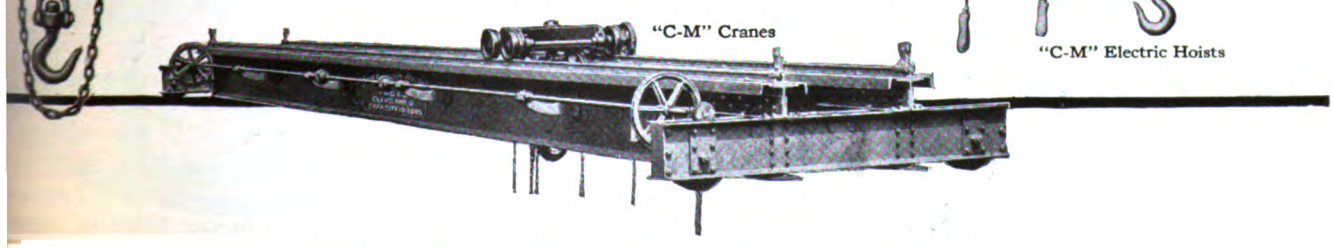
CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

"C-M" is the trademark of a complete line of Overhead Material Handling Equipment backed by an organization ably qualified to apply that equipment correctly to every material handling condition. "C-M" Engineering Service is gratis. The "C-M" policy is based on *"Facts* to show YOU a way to MORE PROFIT!" Write for particulars.

THE CHISHOLM-MOORE MFG. CO.
Cleveland, Ohio
Branches: New York, Chicago, Pittsburgh
Representatives in All Territories for Immediate Service


"C-M" Electric Hoists


"C-M" Cranes

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MEDART
Short Center
Belt Adjuster

Eliminating the shortcomings of open belt drives, Medart Short Center Belt Adjusters possess the good features of other drives. Automatically compensate for varying loads and varying tensions. Solve high-speed reduction problems. Reduce bearing pressures and friction losses, increase arc of belt contact, save space. Widely used for driving line shafts, jack shafts, generators, air compressors, pumps, blowers and similar equipment. Quick shipment.

Get Medart Catalog No. 43 and discount sheet — for Everything in Line Shafting Equipment and Bulletin on Timken-Equipped Line of Industrial Applications.

THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
Office and Warehouse in Cincinnati
Manufacturers of Power Transmitting and Kindred Machinery

MEDART
Everything in Line Shafting Equipment

Shop Practice

Re-Conditioning Process Saves Belt Waste

IT is stated that a considerable amount of the greasy oil-soaked and apparently useless ends and scraps of leather belting which tend to accumulate in the odd corners of almost any plant repair department, can be utilized by a new belt re-conditioning process.

Leather usually fails because of the accumulation of dust and grease. This causes the material to become stiff, to run unevenly, to crack and finally to break. If however, the leather is relieved of its accumulations both on the surface and in the inside fibres, it is often possible to put it back into useful work again.

The first step of the process is to sort out from the pieces of belting sent in, all those which are too far gone to be worth re-conditioning. The plies and joints are then opened up and the cement removed. A thorough cleansing operation next removes all trace of dirt and grease from every part of the leather and opens up the pores of the material. It is now clean, but lacks the essential oil which creates the distinctive leathery quality on which its future usefulness depends. These are restored by immersion and currying and the various scraps are assembled into lengths of practically new belting at it is claimed, about one-third of what new belting would cost.

In order to give strength and to resist stretching, the outer plies of the re-conditioned belts are made from new first quality oak tanned leather, the pulley surfaces being the re-conditioned material. Since it is well known that the gripping power of an old belt is generally greater than that of a new one, the belts thus treated are equally strong and often more efficient than new belts, as well as being almost indistinguishable from them in general appearance.

Determining the Proper Size of Car Wheels

By M. E. Clements

HOW big should a car wheel be, to give a maximum of service and speed and a minimum of power reducing resistance? This may not seem to be a particularly momentous question, but the size of the car wheel has a very important bearing on the load that a car can carry. As the number of cars of all kinds used constantly in transporting the diversified products of industries of the United States runs into many millions with the number of car wheels running into still many millions car wheel size will be seen to be rather a matter affecting the cost of producing and transporting and distributing every conceivable variety of industrial material, and therefore having considerable bearing on the ultimate cost of manufactured products.

In order to determine the effect of the size of wheels on the performance of mine-cars, the Federal Bureau of Mines and Carnegie Institute of Technology have conducted a study of mine-car friction losses

cts not advertised in this issue write Industry Illustrated
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The Devil finds NO Work for Idle Hands in the factory



SHUT DOWNS



ACCIDENTS



REPAIRS

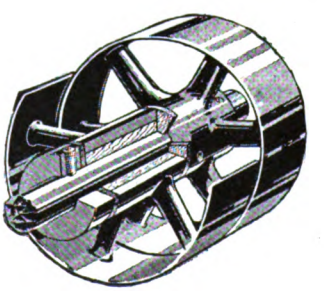
WHEN the devil Friction lays his crippling clutch upon countershafts and pulleys, somebody must pay—and pay big—in burned bearings, accidents, shut-downs. And every manufacturer knows that this means idle hands—no work—unproductive time—that quickly turns his profits into loss.

"Arguto Bearings didn't just happen." They represent years of development. Back in 1890 we first experimented with the elimination of *oil* for Journals of Small Electric Motors, Spindles for Textile Machinery, etc. It was not until 1896 that the world renowned scientific society, The Franklin Institute, after a long period of tests, awarded us the Franklin Medal and Premium. Also Gold Medals of International Exhibitions.

Arguto—the non-metallic Bearing that requires no oil and lasts for years—is the result of long years of hard work and development.



The 22 year oil-less record of Arguto Bearings can be verified by users. Names and facts furnished on request.



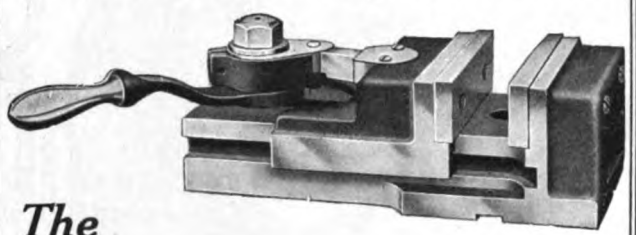
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Wayne Junction, Philadelphia, Pa.

Arguto OILLESS BEARINGS

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The "PRONTO"

Quick Operating and Wide Opening Lever Vises

Made in Three Sizes

No. 1—6¼" long—8 lbs.....$50.00
No 1½—8⅛" long—17 lbs..$60.00
No. 2—9¼" long—33 lbs....$70.00

Prices Subject to a Discount of 45%

A slight movement of the lever and the jaws close with a grip of steel. This is just what you need where a great many pieces must be handled and handled quickly.

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"PRONTO" Quick Operating and Wide Opening Lever Vises are made in the sizes shown. Write for descriptive circulars.

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Successors to Carter & Hakes
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influenced by wheel diameters. Friction, of course, means loss of power in the running gear of the cars. The results of the study are applicable also to car equipment used in other than the mining industries.

It was conceded that the capacity of mine-cars could be further increased, and the cost of mine haulage correspondingly reduced, by the use of smaller diameter wheels, if it were not for the greater friction loss of trucks equipped with small wheels. The object of the experimental work was to determine the relative friction loss, on straight track, of a typical modern mine car when equipped successively with wheels of different diameters. Observations were also made of the effect of variations in speed, load, and lubricant; and a rough measurement of rolling friction was made, showing what proportion of the total friction is due to the simple rolling contact of the wheel on the rail.

As the investigation was in a new field, new testing devices had to be developed. The experimental track was composed of steel rails weighing 40 pounds per yard. The track was 150 feet long, comprising 90 feet of straight track on a 1.5 per cent. grade, and 60 feet of track bent to a 40-foot radius curve, continuous with the straight track at its highest end, so that the car would be pulled uphill and then enter the curve. The method used for bringing the car up to speed and pulling it steadily along the track was by operation of an electric hoist the drum of which was driven by a 5-hp. constant-speed induction motor. Rope speeds up to 6 miles per hour were obtainable.



Checking the friction loss in roller-bearing wheels.

The car used for making the principal series of tests was a thin-seam (coal) type, weighing 2,000 pounds when stripped of wheels. The car was loaded with tons of pig iron, each pig being weighed and marked to make it easier to change the load quickly to any weight desired. For the wheel diameter tests, the largest and smallest diameter wheels that could be obtained were employed. Thus the wheels ranged, in six different sizes, from 8 to 20 inches in diameter.

The speed of the car was obtained by recording the time taken to pass over known distances. At 2-ft. intervals a switch was placed alongside the track, which was closed as the car went by. The closing of the switch caused a mark to be made on the chronograph record, so the time between switches could be easily obtained. A portable dynamometer to measure drawbar pull had to be designed. When determining friction by pulling

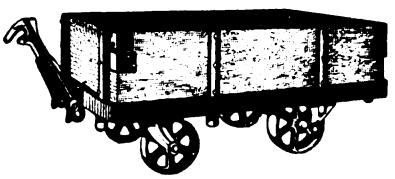
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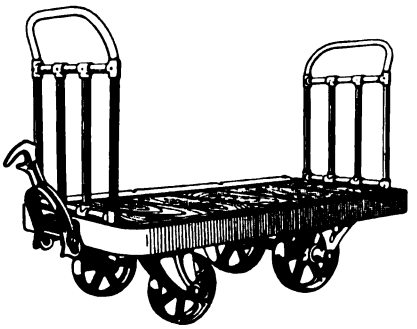
Manufacturing —vs— Building



A-310—all purpose castor steer trailer



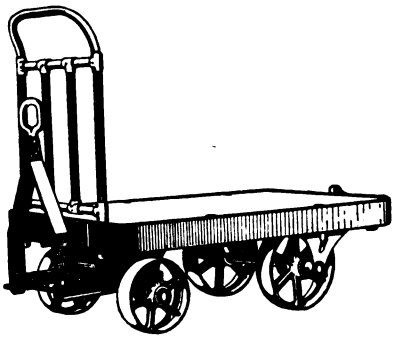
A-310 — with removable side boards



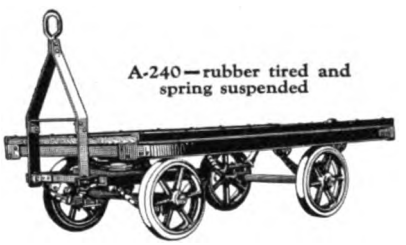
A-410 — 4-ton, castor steer trailer



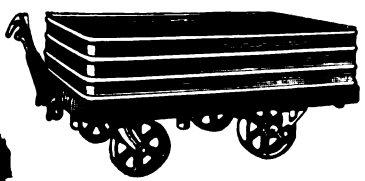
A-310—with permanent end racks



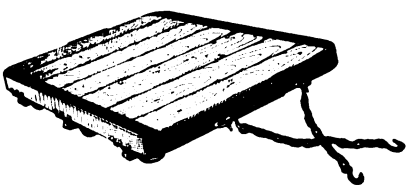
A-510 — 4-ton, fifth wheel (wagon-type) steer



A-240 — rubber tired and spring suspended



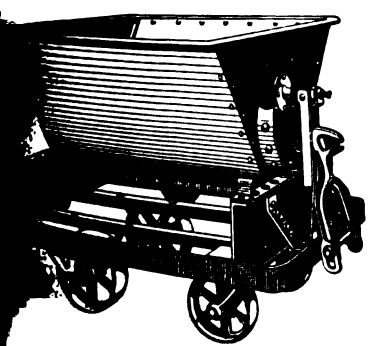
A-310—with corrugated box body



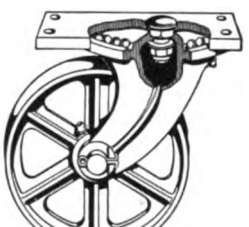
A-401 — heavy duty dolley



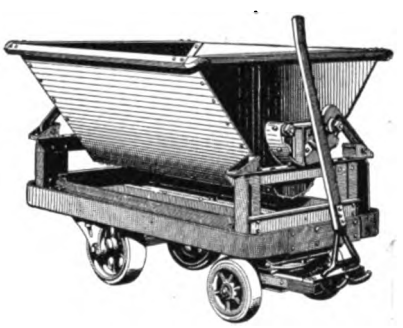
A-124 — 4-wheel steer for long commodities



A-310 — with gravity dump body



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A-570 — heavy duty side dump body

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Manufacturing trailers means: — quantity (carload) purchase of materials; standardized machine methods; skilled supervision; uniform high quality; low cost; delivery on time; real service.

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4112 South Halsted Street **Chicago, U. S. A.**

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A Buying Guide For Quality Equipment



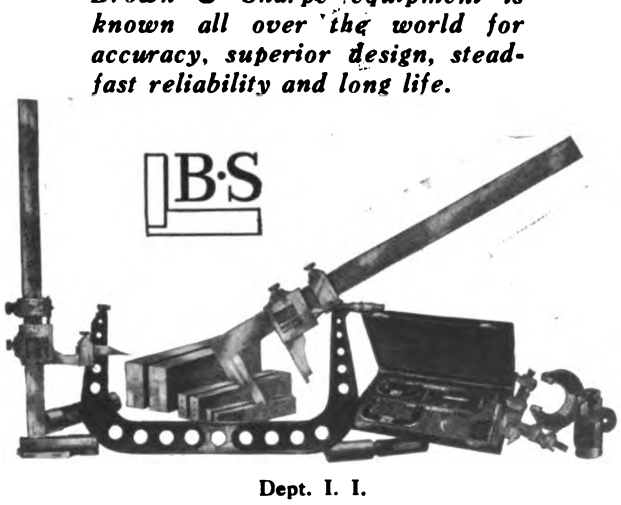
"There is a time and place for everything" some man of wisdom has said.

The time to get a Brown & Sharpe catalog is now and the place for it is right on your desk.

This book is more than a catalog. It is a buying guide for quality equipment that will help you maintain the lowest possible manufacturing costs.

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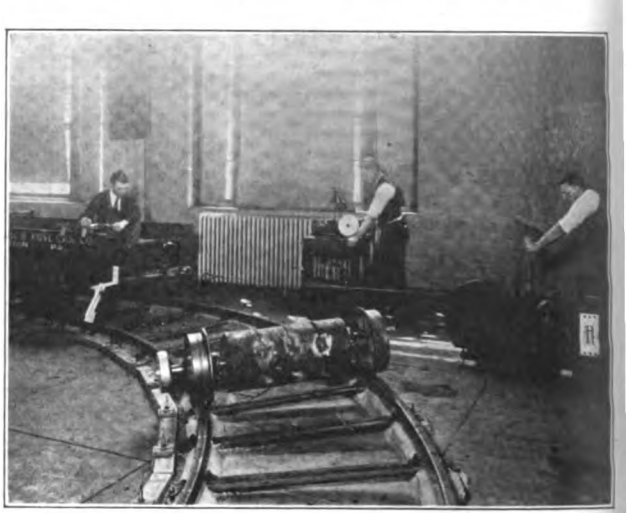
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BROWN & SHARPE TOOLS

"World's Standard of Accuracy"

car along the track at a constant speed, one observer sat in the car to read the dynamometer, while a second observer started the chronograph and later sighted along the rails to insure freedom from undue flange contact.

As a result of the experiments, it was found that the larger the wheel diameter the lower was the relative friction, with all types of lubricants, and distinctly moreso the heavier the lubricant employed, though it is doubtful whether roller bearing wheels larger than 14 inches in diameter are justified in practice. The friction of roller bearings is greater with heavy grease than with light oil, especially for small wheels and light loads.



Track dynamometer recording the car pull for different sizes of wheels.

The power saving possible on straight track through use of larger wheels may amount to 38 per cent. in changing from 8 to 18 inches in diameter. The possible saving by using larger wheels is greatest when the bearing friction is relatively high compared to flange friction. The rolling friction under loads of about 1.4 tons gross was found not to exceed one-third of the total friction and it was found that the rolling friction is but little influenced by speed.

The investigation offers suggestions on wheel diameters and lubricants to the car manufacturer, and is worthy of study by the transportation division of mining companies where power is a real consideration, especially when the power variations must be kept within narrow limits owing to the use of storage battery locomotives.

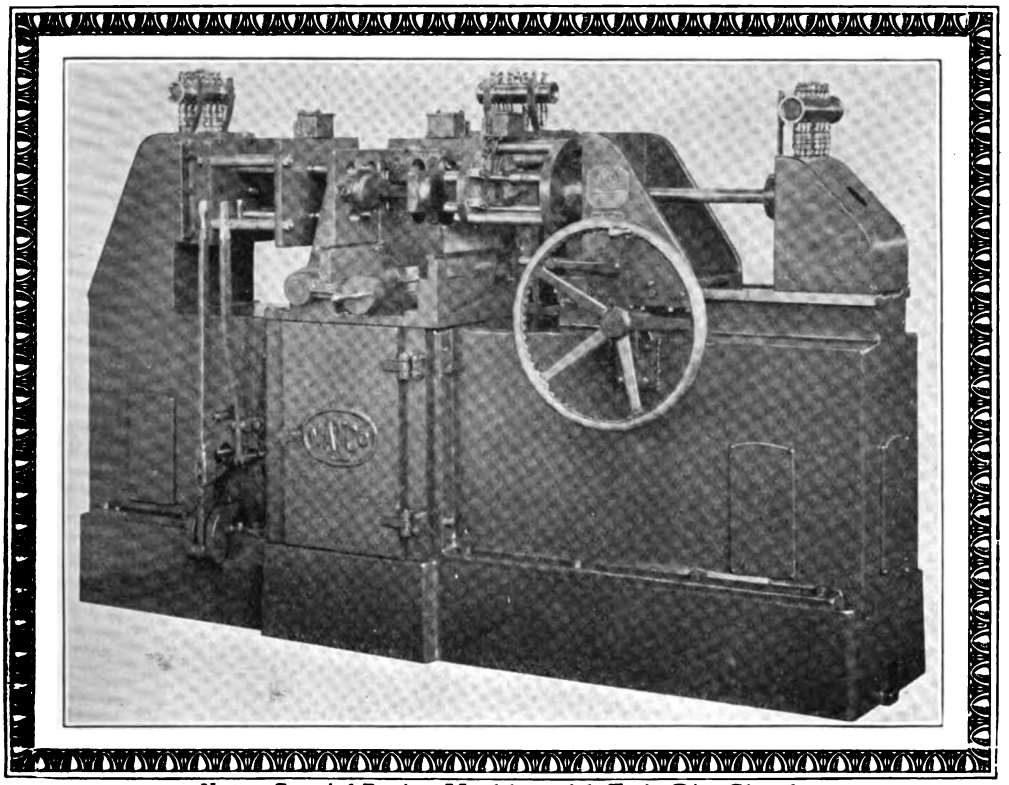
Adjustable Holddown for Squaring Shears

THE Niagara Machine & Tool Works, Buffalo N. Y., has recently designed and applied for patent on a new type of squaring shear holddown, combining lightness and rigidity, adapted particularly for long squaring shears.

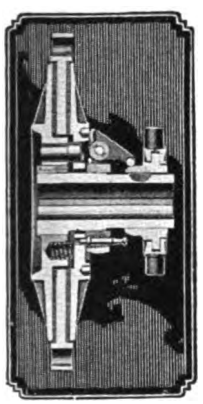
It is stated that the new holddown clamps the sheet securely and uniformly with the result that a clean and accurate cut is obtainable.

The holddown works automatically and is timed to grip the sheet firmly until the cutting is completed. The horizontal member of the holddown is a steel channel light but rigid. It is guided on finished surfaces at both ends.

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Natco Special Boring Machine with Twin Disc Clutch



PARTS STATIONS

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Detroit—Whitney Brothers, 6464 Epworth Boulevard.
Los Angeles—Coast Machinery Corporation, 406 E. Third Street.
New York City—E. George & Co., Broome & Wooster Streets.
Philadelphia, Pa.—Maerky Machine Works, 240 Cherry St.
Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn Avenue.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie Street.
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TWIN DISC CLUTCHES

ANY machine tool in which the Twin Disc Clutch is used will turn out more work at less cost, because—

A Twin Disc Clutch transmits all the power to the work. The clutch action is gradual until the driven member attains full speed. Extra large frictional areas permit of any necessary slippage without seizing, overheating or undue wear.

Extremely flexible and easily adjusted, Twin Disc Clutches can be engineered into almost any machine tool without changing its design. Consult our engineering department.

TWIN DISC CLUTCH COMPANY

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Grinds Work to
20"x6"x10" Standard
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With 7" Wheel



Table travels automatically in both directions. A hand-power table movement can be operated without changing automatic feed.

Also has automatic cross feed in either direction with automatic stop. Wheel truing device is built integral with machine. Price, $550. F. O. B. La Salle, Ill.

YOU WILL FIND nothing better than the La Salle No 2 Automatic for grinding dies, punches and a wide range of small tools, as well as for many manufacturing jobs. Exceptionally rigid, it has ample provision for preserving perfect alignment. Arranged for either wet or dry grinding, with belt or direct motor drive.

LA SALLE GRINDERS include our No. 1 at $115 and No. 3 Plain and Surface Grinder at $365 to $390; No. 2 Automatic Surface Grinder; and American Wet and Dry Drill Grinders in various sizes at $120 to $350—each a real leader in its class. *Write us about the capacities of these modern Grinders.*

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DART UNIONS



are Non-Corrosive Absolutely Tight and Leakproof

THE Bronze-to-Bronze seats in Dart Unions prevent leakage. They are ground to perfect ball and socket bearings. Require no packing.

Try a Dart Union and put it anywhere for trial. Then you can judge for yourself. Remember every DART Union is guaranteed. Should one prove defective in material or manufacture we would gladly replace it two for one.

Send for prices, catalog and sample.

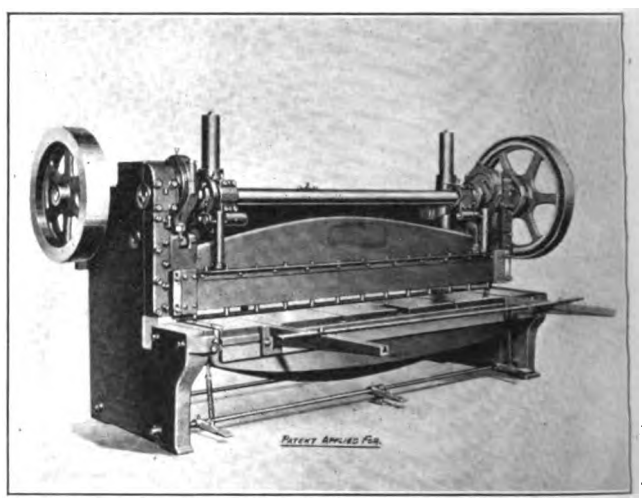
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Each foot of this holddown has an individual spring cushion. Therefore, each foot is independently self-adjusting for wear and for different thicknesses of material. Unevenness of metal, kinks in the sheet, dirt and other foreign matter are compensated for locally, without disturbing the gripping pressure at any other part of the holddown. Sheets shorter than the shear's length are gripped with equal uniformity and without tilting the holddown, regardless of whether they are cut in the center or toward the ends of the shear.

The pressure exerted by each foot is independently adjustable, so that varying or non-uniform clamping pressure may be secured if desired or necessary. For instance, the gripping pressure of the individual feet can be set to give a higher pressure toward the ends of the shear, decreasing to the center or vice versa. This condition is sometimes required when cutting material that is not uniform.



The two cams that operate the holddown are on the main shaft of the shear close to the heavy center bearings. The cam rollers are of hardened steel and run in an oil bath. The levers actuated by the cams close a toggle, so that little effort is required by the cams to exert considerable pressure on the holddown. The closed toggle links bring the holddown into play, and transmit the pressure stresses directly to the housings. This relieves the moving parts of all those heavy vertical stresses which in the ordinary cam holddown burden the cams main shaft and bearings of main shaft.

When the toggle is broken after the cut has been completed, the holddown is raised by springs. These springs are of the compression type and are completely encased.

Standardized Machine Speeds to Reduce Stock of Transmission Parts

STANDARDIZATION on a national scale of the speeds of machinery is proposed by the National Electrical Manufacturers Association in a request to the American Engineering Standards Committee to take the matter up with the purpose of simplifying and clarifying the existing situation which is stated to constitute a serious burden on industry through the resulting waste and confusion.

In making the request, the association states:

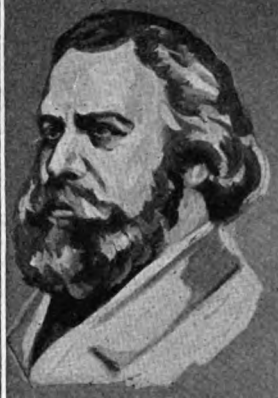
"Under present conditions the curve of the speeds of driven machinery is practically a random distributio

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FAMOUS SEXTETTES



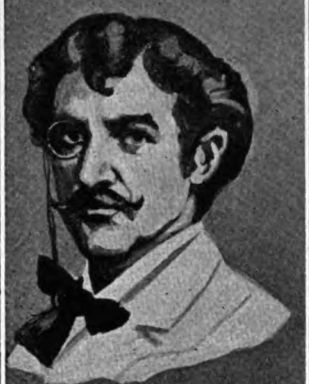
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1916 PATTERN

No.	Length of Handle Inches	Size of Opening, Inches Square	Hexagon
0	7	¼, ⅜, ½	½, ⅝
1	10	⅜, ½, ⅝	⅝, ¾, ⅞
2	12	½, ⅝, ¾, ⅞	¾, ⅞, ⅞, 1
3	15	⅝, ¾, ⅞, 1, 1⅛	1, 1⅛, 1⅜, 1¼
3½	18	1, 1⅛, 1¼	
4	18	1, 1⅛, 1¼, 1⅜, 1½	1⅛, 1¼, 1⅜, 1⅜
4½	24	1½	1½

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Parks shipping room saw
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Big work; little price — that's the "Dixie" shipping saw. Fast. Durable. Guaranteed for 10 years.

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PARKS
WOODWORKING MACHINES

without any logical ordering of the values used. As a result of this, the sizes of pulleys, gears, sprockets, etc., which manufacturers have to produce, and which manufacturers, jobbers, dealers and users must keep in stock have been multiplied almost endlessly.

"While the need for simplification of driving and driven connections has been apparent for years, particularly to producers of electric motors, steam engines, etc., nothing has been accomplished, because without coördination and standardization of the speeds of driven and driving machinery considered together, no satisfactory solution can be obtained."

It is the view of the electrical manufacturers that the proposed standardization which should result in a relatively small number of coördinated speeds for the almost innumerable kinds of machinery, would afford an easy approach to the problem of simplification and standardization of pulleys, gears, sprockets, etc. ,and would permit much greater flexibility in the selection and use of both power units and driven machinery, greatly promoting interchangeability of such units, and providing economies for innumerable industries dependent upon such equipment.

As the first step, the American Engineering Standards Committee will convene a general conference of the principal trade associations, technical societies, and other groups interested in this subject.

Machine Guards Increase Speed of Production

By V. L. Howe

IN this age of industrial speed, competition dictates that production be continually increased. High speed cannot be safely secured unless the operator is properly protected.

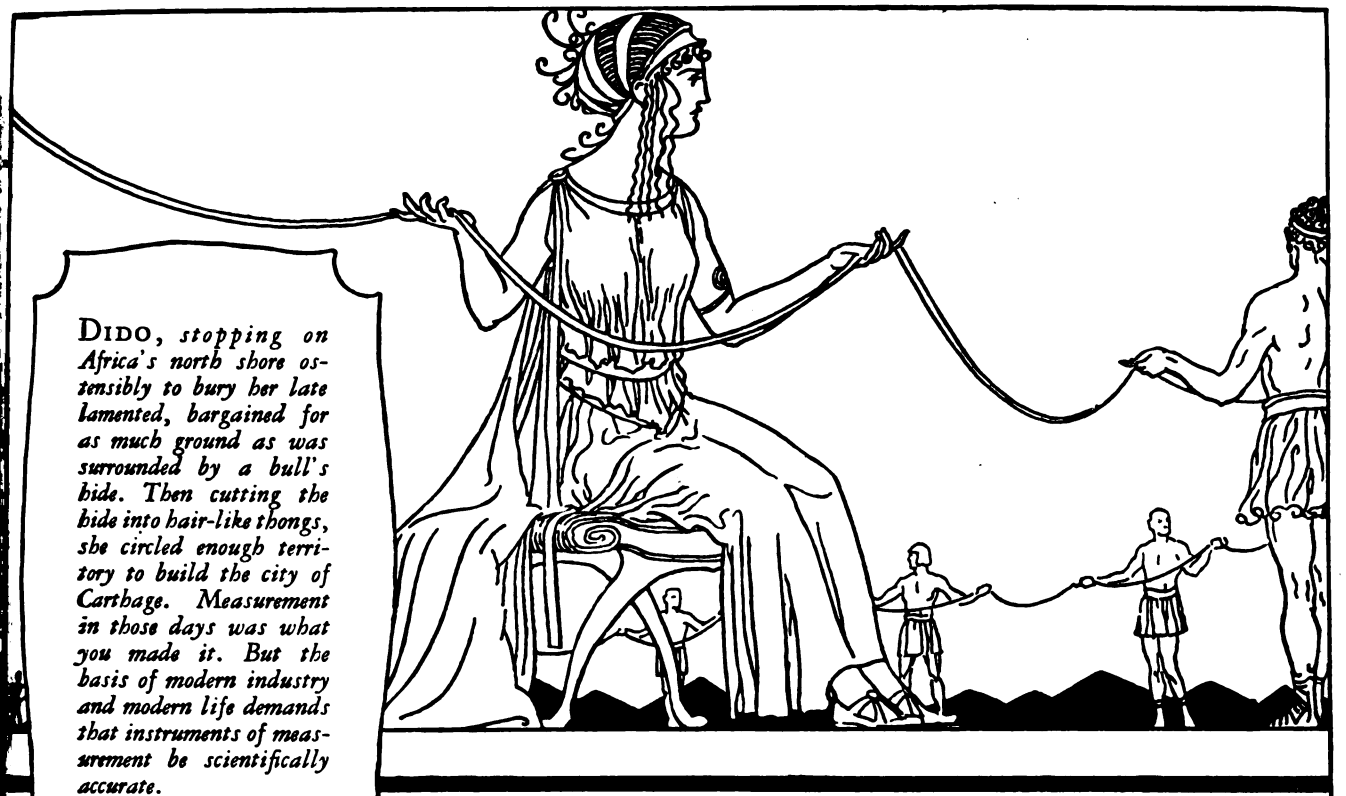
All gears, sprockets, chains, cams, clutches, etc., and even the universal joints should be either completely enclosed or covered by a substantial guard. All hand wheels should be constructed so that they automatically disengage, thus preventing injury from a rapidly rotating handwheel when power feed is being used.

Dust deflectors, wheel guards and belt guards on grinding machines; hinged covers over change gears and substantial guards for belts on gear cutting and hobbing machines; complete enclosure for feed and speed change mechanisms and safety stops which prevent overtravel of table and knee on milling machines and a complete guarding of all cams, clutches and gears on screw machines are essential if maximum production speed is to be obtained without risk of accident of operator or machine.

In addition to the above, in so far as consistent with correct and efficient design, the operating controls should be concentrated at the front of the machine within immediate reach of the operator. This simplifies the operator's task and shows up favorably on his production sheet.

Again, safety shearing pins, gears, sprockets and clutches, each having a load limit below that of the rest of the mechanism, protect machines from themselves. These agencies eliminate the breaking or stripping of working parts when undue strain is imposed upon the

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DIDO, *stopping on Africa's north shore ostensibly to bury her late lamented, bargained for as much ground as was surrounded by a bull's hide. Then cutting the hide into hair-like thongs, she circled enough territory to build the city of Carthage. Measurement in those days was what you made it. But the basis of modern industry and modern life demands that instruments of measurement be scientifically accurate.*

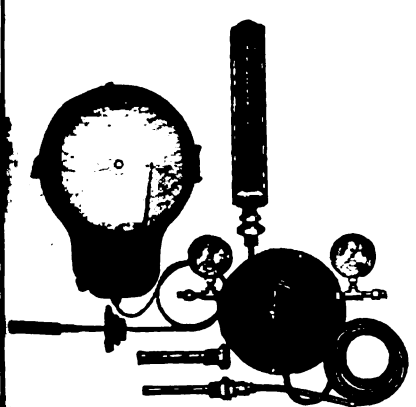
The man who buys an instrument of measurement from you expects you to

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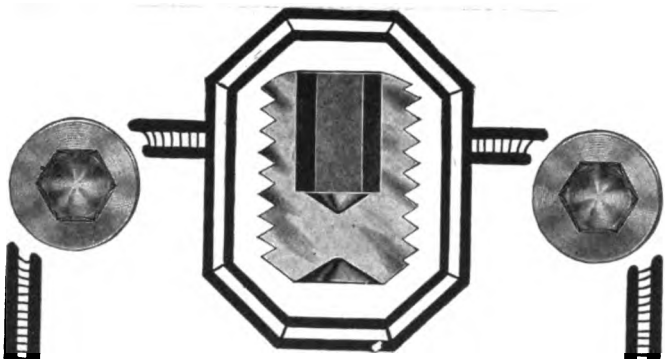
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You pay two prices, every time, when you pay too low a price. Once when you get the screws; once again when you get them out and replace them.

We can offer a one-price hollow screw because the price includes the Allen *cold-drawing*, which makes a practically unbreakable screw—30% stronger.

Special-analysis alloy steel; patented cold-drawing; scientific heat-treating:—all for one honest price that's honestly the last!

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The Allen Mfg. Co.

127 Sheldon St., Hartford, Conn.

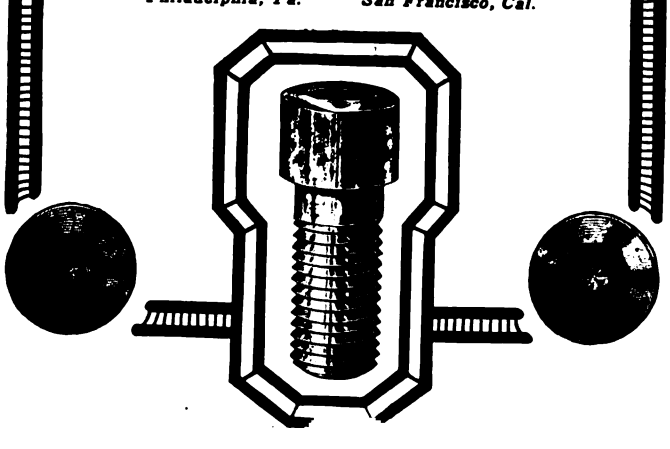
Branch Offices:

W. C. Stauble
2909 Waverly St.
Detroit, Mich.

R. E. Gregory
1029 Wesley Ave.
Evanston, Ill.

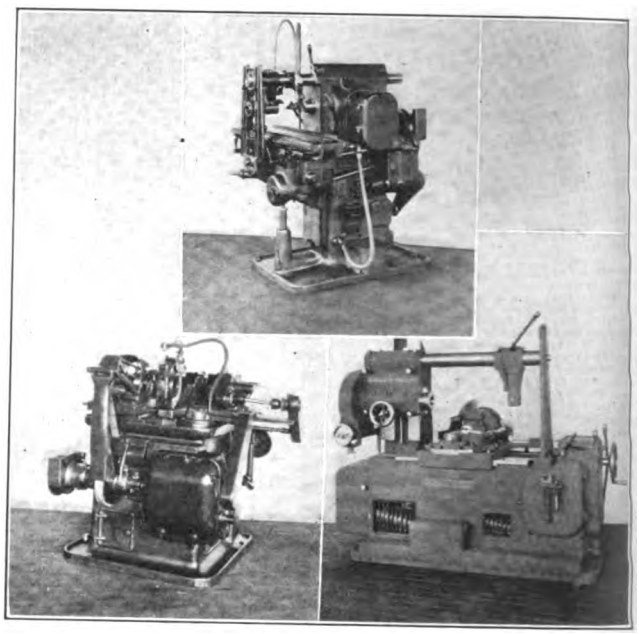
E. P. Crawford
3348 No. Park Ave.
Philadelphia, Pa.

W. J. McRae
320 Market Street
San Francisco, Cal.



machine and the time necessary to replace one of these, when compared to the amount of time formerly required to repair a tie-up is small. Safety stops which operate automatically in case the operator fails to set the trip dogs, also prevent damage to the machines.

Also there are numerous protective arrangements provided to reduce the effects of what might be called injurious outside agencies such as abrasive dust and dirt, chips, excessive wear, etc. All bearing surfaces lending themselves to the collection of injurious matter are adequately guarded so that the accuracy of the machine is preserved. Complete and dependable lubrication of all parts needing oil is also assured, thus prolonging the life and precision of the machines.



Above: Completely guarded high production miller fully guarded even to the pump drive. Left: Grinder with guards for belts, speed and feed-change and drive universal joints. Right: Gears, bearings and index wheel of gear-hobber fully guarded.

Thinned Oils Mean Burnt Bearings

By G. S. Hamilton

WE all know that after engine oil has been used for a time, it loses its body, and we sometimes refer to the change as breaking down. Oil does not break down, or undergo any permanent thinning out when it is heated.

A mixture of oil and gasoline is naturally thinner than new oil and this is exactly what we have in the crankcase when the oil is said to have "Thinned Out." Unvaporized gasoline in the cylinders leaks past the pistons and mixes with the oil in the crankcase. Whenever there is an excess of liquid fuel in the cylinders this is bound to happen.

We know that new oil will separate the moving parts better than thinned oil, although the latter might give us fair lubrication under ideal conditions. To prevent engine wear we want to separate the moving parts far enough so that the particles of road dust and other abrasives that are carried in the oil film will not touch the

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Willson Safety Goggles are Liked



It's no trouble to get men to wear Willson Safety Goggles. The reason is comfort. The goggles are well balanced, well ventilated, well shaped, and the glass does not cause eyestrain or headaches.

Here's an example of what we mean: No. LJ31½ for chipping, riveting, scaling, grinding and other work. You can standardize this goggle for both light and heavy operations. Of course it is the last word in powerful resistance to blows, but it also has the Willson construction for comfort. Price $17.40 per dozen, including metal cases, f. o. b.



WILLSON GOGGLES, INC., READING, PA.

Manufacturers of industrial safety goggles, welding helmets, welding handshields, and respirator masks for fumes, smoke, dust and spray.

A DEPENDABLE SOURCE OF SUPPLY

GITS BROS.

Better Oilers

287 Styles & Sizes



GITS BROS MFG. CO.
1940 S. Kilbourn Chicago.

OIL CUPS
OIL HOLE COVERS
WIRE WICK FEED OILERS
OIL RESERVOIR FILLERS

Quality Oil Cups for Every Purpose



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DIXON'S
Graphite Products

Flake Graphite — **Boiler Graphite**
Graphite Cup Grease — **Paste Belt Dressing**
Waterproof Graphite Grease — **Pipe Joint Compound**
Solid Belt Dressing — **Silica-Graphite Paint**
Graphite Spring Oil

The best graphite and the right graphite for each particular purpose are the reasons for the superiority of Dixon Graphite Products.

We have had one hundred years' experience in manufacturing and marketing graphite and graphite products. In this period the word, "Dixon" and "Graphite" have become synonymous to thousands of exacting men in every line of industry.

There is No Substitute for Dixon's

Dixon's Ticonderoga Flake Graphite. Ideal for cylinder and bearing lubrication, for coating gaskets and for any other purpose where a better graphite is desired.

Dixon's Graphite Cup Grease. The best quality mineral stock correctly proportioned with lubricating flake graphite. It has the property of flowing into the bearing as soon as the shaft begins to turn, bearing heats and softens it. Produces dead smooth, graphited bearing surfaces—insures cool running engine, motor, shaft and other bearings.

Dixon's Solid Belt Dressing. Keeps leather belts pliable and decidedly lengthens belt life. Stops slipping instantly. Use for leather rubber or fabric belting.

Dixon's Waterproof Grease. Protects and lubricates elevator plungers, pump plungers, gears, wire ropes, and other parts exposed to weather or submerged in fresh or salt water will not flush off.

Dixon's Silica-Graphite Paint. For the protection of metal surfaces against moisture, water, acid, alkali and other rust creating agencies.

Write for Booklet 61-KP. and Prices

JOSEPH DIXON CRUCIBLE COMPANY

Jersey City — New Jersey

1827 *One Hundredth Anniversary* **1927**

Slack Belts for *Full* Power

It is not belt tension but belt *grip* that guarantees full transmission of power. And belt grip is secured by running belts slack after treatment with Cling-Surface. This gives belt-hold on pulley like the firm grip of a moist hand on a hammer handle or bar—eliminating power loss from slippage, bearing and lubrication overheating; and insuring many, many years of continuous belt life.

Over thirty years of world wide use has proved the effectiveness and economy of Cling-Surface as a belt and power saver. Let us refer you to many users in your own vicinity or let us prove the worth of Cling-Surface in your own plant without a penny of risk.

TRY on approval

Use Cling-Surface 60 days under warranty that it will do all we claim, or you need not pay. Order 1, 3 or 6 gallons on trial at $3.50 per single gal.; @ $3.40 per gal. for 3 gals.; @ $3.25 per gal. for 6 gals. Advise whether or not your plant is warm, dry, dusty. Begin saving belts and belt bother today. Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Cling~Surface

The Scientific Belt Treatment



metal surfaces and cut them. This road dust and abrasive material is drawn in with the air through the carburetor to an extent that varies with the operating conditions.

For the longest engine wear the oil should not be allowed to thin out too much and abrasives should not be allowed to accumulate. If oil is changed at proper intervals, at least every 50 hours of service, the abrasives, under ordinary conditions, will not accumulate to an extent that will cause damage. Oil which is not used too long and which is kept reasonably warm is usually clean oil of proper body. With this protection the engine will give many times the service that would be possible otherwise.

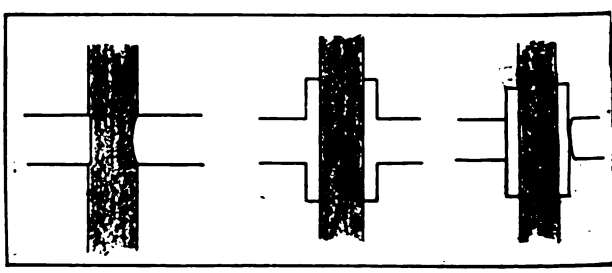
How to Measure Belt Thickness

By S. F. Wilson

SOME time ago a sales manager told me how to measure the thickness of anything that is soft, such as leather.

He said that in many instances purchasers find that the thickness is less than specified and refuse to pay the full price. The trouble usually is, however, that these people are not equipped with the right kind of measuring device and they do not know how to do it with ordinary instruments. They do not do it in the right way. He went on to tell how he takes his micrometer along with him when he visits the complaining buyer, and proceeds to demonstrate that the buyer is wrong.

This is the way he does it:



He produces a piece of sheet metal and measures its thickness with his own micrometer and has the buyer measure it with the buyer's micrometer. The measurements jibe very closely where both instruments are calibrated correctly. He then measures a thicker piece of sheet metal and they jibe again. They also correspond when measuring thinner metal, glass, or other hard substances.

The manager then says: "It is evident that our instruments are both accurate. We will now measure the leather."

Here, however, is where the buyer's micrometer fails to register correctly. It shows a "thinner" reading. And it is all because of the fact that the micrometer is not provided with sufficient bearing surface to measure soft leather. The pressure produced on the leather is sufficient to compress the fibers slightly, the contact "sinks in" and the reading is therefore thin.

The sales manager's micrometer is provided with a broad bearing surface therefore does not compress the material appreciably, hence the difference in the reading.

A good way to measure correctly with a micrometer incorrectly made is to "make" larger bearing surfaces as indicated in the sketch herewith and subtract the combined thickness of the metal pieces from the total.

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Hundreds of Plants *Now* Adopt ROWELL Bottom Pour Ladles!

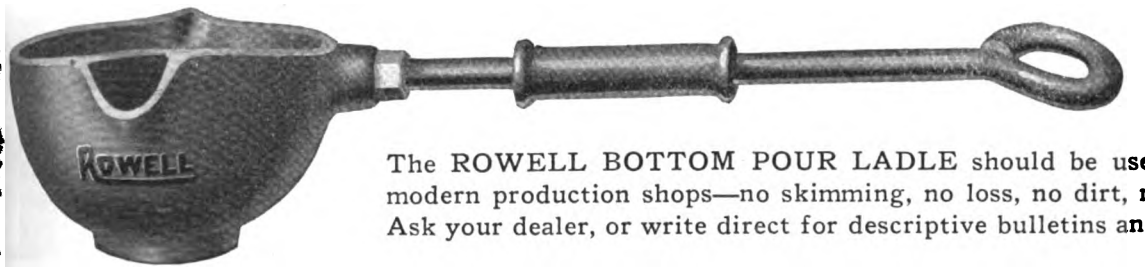
(Self Skimming)

Shops throughout the country, wherever production costs are studied and where savings in time, labor and metals are desired, are adopting the BOTTOM POUR LADLE.

The BOTTOM POUR LADLE gives the absolute assurance of safety in pouring and eliminates skimming which is necessary when top pour ladles are used.



Interior View of Ladle



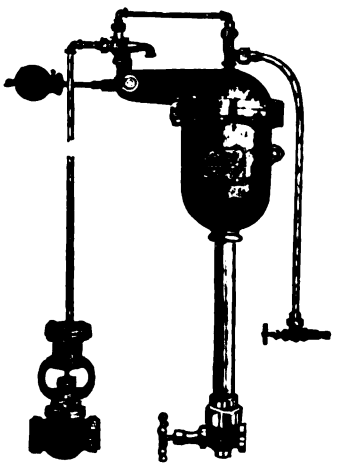
The ROWELL BOTTOM POUR LADLE should be used in all modern production shops—no skimming, no loss, no dirt, no dross. Ask your dealer, or write direct for descriptive bulletins and prices.

You know the danger associated with skimming. You can prevent many accidents by using the ROWELL BOTTOM POUR LADLE.

ROWELL MANUFACTURING CO.

APPLETON-WISCONSIN

O. K.



The experienced power plant engineer knows that a constant water level in boilers is essential if the plant is to be run economically.

So he puts his O. K. on

VIGILANT

Feed Water Regulators

They eliminate careless hand feeding and assure a constant water level. Boiler strain is reduced, steam production is increased and fuel economy is secured.

Play safe with a Vigilant.

Write for catalogue.

The Chaplin-Fulton Mfg. Co.

28-36 Penn Ave., Pittsburgh



Remember the old-time "cure-alls"?

REMEMBER the old-time "cure-alls," remedies for every ailment, panaceas dispensed at a dollar a bottle to the accompaniment of bewildering sleight-of-hand? Spurious correctives such as these have long since disappeared, have given way before the advance of modern scientific progress.

So too, with wasteful, costly cleaning materials such as lye, potash and similar strong alkalies that retard production, increase costs, and lower quality.

Today's need is for *scientific* cleaning. Material and method must be fitted to each particular cleaning task. That is why over 18,000 progressive concerns are cleaning the modern, scientific Oakite way.

It will pay you to investigate, as they have done, to learn whether you, too, cannot improve cleaning. An Oakite Service man will gladly confer with you, without obligation.

Oakite Service men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

OAKITE IS MANUFACTURED ONLY BY

OAKITE PRODUCTS, INC., 40A Thames St., NEW YORK

(Formerly OAKITE CHEMICAL CO.)

OAKITE

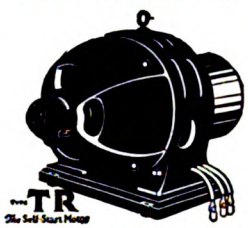
Industrial Cleaning Materials and Methods

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Should any motor have a "compensator" today?

Here's the answer!





The TR Super-Motor—*no compensator in any size*—applied on *running, not* starting load. Cuts first cost and current costs. Lowest cost push-button control. Write for bulletin.

Here are 44 TR Super-Motors driving rendering tanks in the Indianapolis Garbage Disposal Plant. Motors are thrown across the line by automatic switch (no compensator) and they bring the agitators up to speed in about 3 minutes. Other makes of 15 hp self-start and squirrel cage motors proved incapable of starting the load. Unless 15 hp TR's were used, 20 hp motors were required.

Just another example of how and why the modern TR Super-Motor saves money. No compensator, and a 25% to 60% smaller motor! When the application engineer says "compensator control" that's the time to change to TR Super-Motors and a push-button!

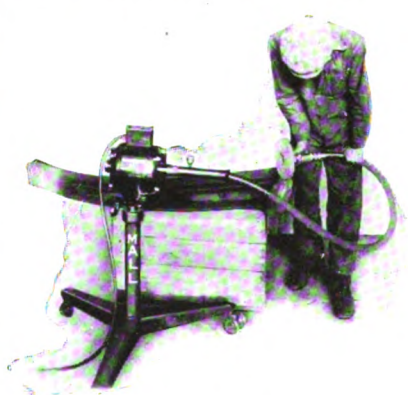
Get the facts about the TR Super-Motor and learn how to cut your power-costs. Send for Coupon!

THE TRIUMPH ELECTRIC CORPORATION

Builders of squirrel cage, slip ring and TR Super-Motors since 1892

157 East 70th Street **Cincinnati, Ohio**

Efficient Metal Finishing



Type D4—1 HP Mall Portable Grinder

Electric Flexible-shaft grinding machine using an 8" diameter x 1" wide rubber bond combination disc and edge grinding wheel operating at 3450 R.P.M. to finish steel castings.

MALL

Makers of the largest assortment of flexible shaft machines and attachments in the World. Shipments made on approval.

Write for illustrated catalog.

MALL TOOL COMPANY

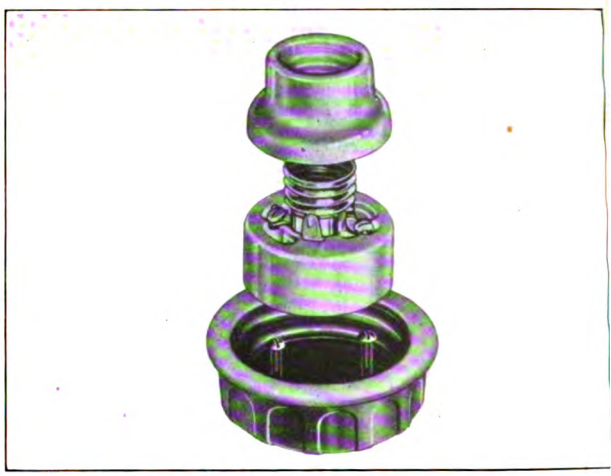
7720 So. Chicago Avenue

Chicago, Illinois

Electric Devices

Quick Removable Socket

A NEW light socket just introduced embodies two new principles in socket construction. (1) The socket base is fastened to the canopy by screws fitting into bayonet holes. A twist of the wrist removes or replaces it in a moment. (2) The porcelain socket shell screws on and off the cap easily, exposing the contact screws for ready wiring. It can be wired and installed with remarkable speed.



Stand-by Lighting Set for Break-down Service

THE lighting set shown is an automatic stand-by source for electric lighting or power; for use any place where operating conditions require unfailing operation.

This system has a very wide range of uses, as in factory and industrial buildings where lighting of the ex and portions of the buildings must be continuous, a where certain processes must be carried on continuous In most of the various classes of applications, one failu



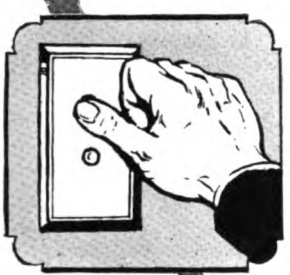
of the lighting or power supply would have paid for emergency installation.

If the main power source fails, for any reason

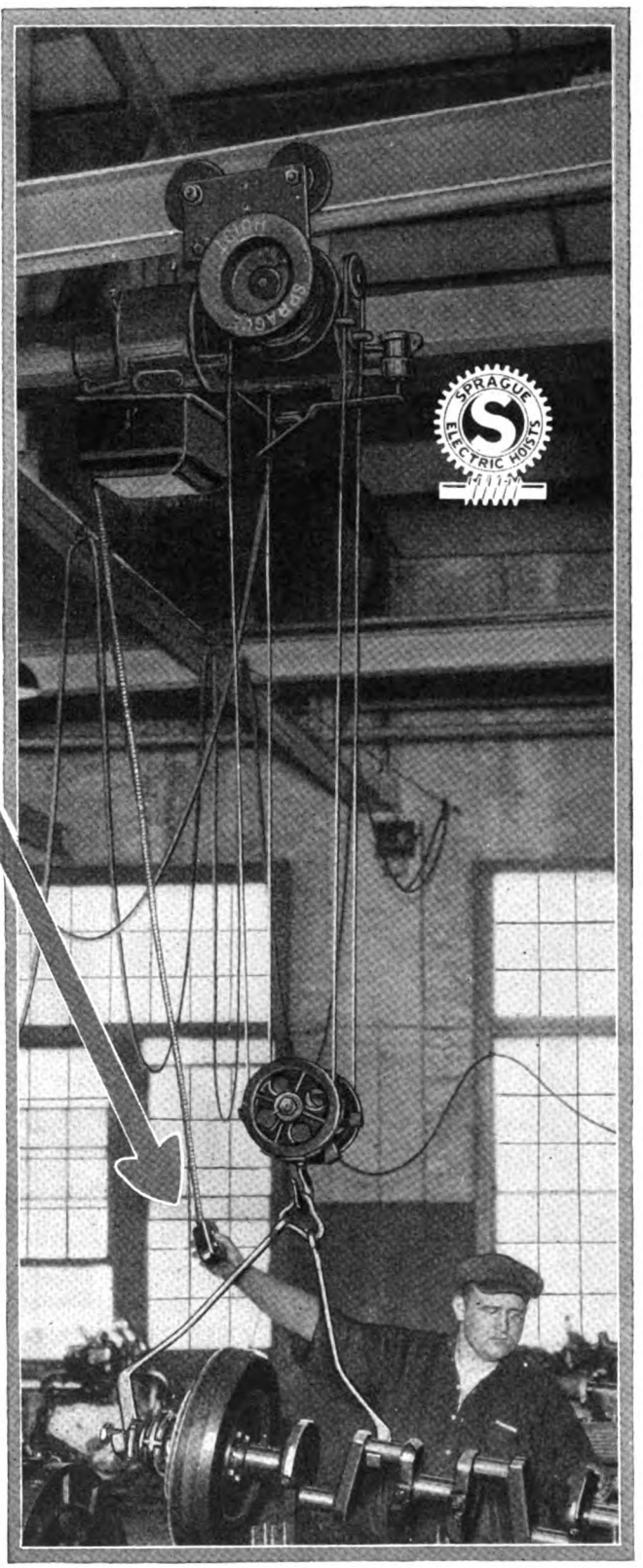
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"easy as switching on the lights"



SPRAGUE
PUSH BUTTON
CONTROL



Press a button for "up", press a button for "down".

Jog the load a fraction of an inch if necessary—or run it the full length of the hoisting cable.

You can manipulate loads with a remarkable degree of precision when you use a Sprague Push Button Control Hoist.

The push button station is held in one hand, allowing a free hand to guide the load. It may also be installed at a remote point, if necessary.

These hoists are supplied in ¼, ½, 1, 2, 3, 4, 5 and 6 tons capacities for direct or alternating current. They have worm gearing (simplicity in itself), automatic lubrication, are thoroughly enclosed, and will give you a reliable year in and year out service.

Let us quote on your hoist requirements.

SPRAGUE ELECTRIC HOISTS
DIVISION OF
SHEPARD ELECTRIC CRANE & HOIST CO.
30 CHURCH ST. NEW YORK, N.Y.

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We Originate and Build

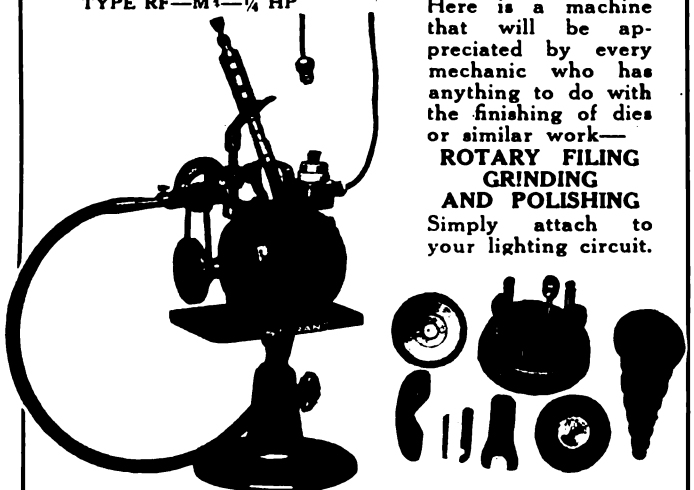
Strand

Twenty-two Years In This Industry

ESTABLISHED 1905

A NEW DEVELOPMENT

TYPE RF—M¼—¼ HP



Here is a machine that will be appreciated by every mechanic who has anything to do with the finishing of dies or similar work—

ROTARY FILING GRINDING AND POLISHING

Simply attach to your lighting circuit.

This Equipment Consists of

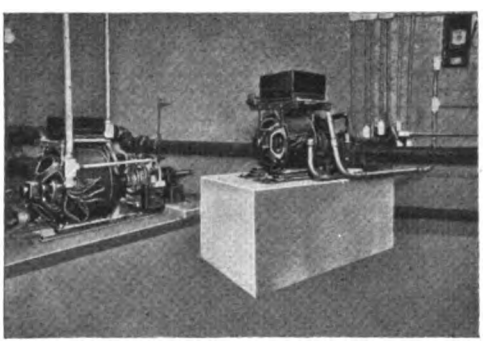
8 assorted shapes, high speed steel, hand cut files, ball hearing hand piece, 9 assorted grinding wheels, 3 wheel spindles for same, 3x1 rubber polishing drum, three speed countershaft, flexible shaft 5 ft. long, ¼ HP. motor, mounted on adjustable swivel stand, wrenches, cord, switch and plug.

We Build Machines from 1/10 HP. to 2 HP. Send for Catalog

Manufactured by

N. A. STRAND & CO.

5001 No. Lincoln St. Chicago



Diehl 3 and 15 H.P. motors used for elevating musicians' platforms in Boston, Mass., Theatre.

DIEHL MOTORS

The view above shows two of many Diehl motors installed in the three and one half million dollar Metropolitan Theatre, Boston, Mass. Diehl engineers, a personnel of seasoned experience, are at your service, ready to advise and help you with your motor problems. Use this service to your profit. Write for descriptive bulletins—now.

DIEHL MANUFACTURING CO.

ELIZABETHPORT, N. J.

ATLANTA BOSTON CHICAGO NEW YORK PHILADELPHIA

DIEHL

ESTABLISHED 1

under any circumstance whatever, the emergency system instantly and automatically takes over the load and carries it for a sufficient time to complete the operations.

It has three sources of supply, the first of which is the regular power supply, either from the central station or the private generating plant.

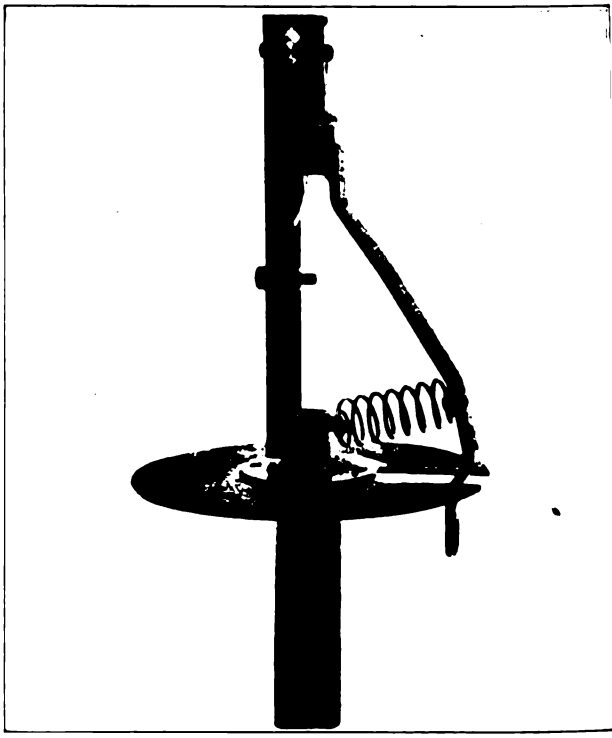
The second source is the special heavy-duty glass jar storage battery of the system. Depending upon the individual requirements of the installation, this battery and the auxiliary apparatus can carry the necessary load for periods as long as eight hours.

The third source of supply is the motor generator itself. The motor generator set is operated on a separate line from the main power supply.

In the event of power failure, an automatic switch on the panel instantly throws the load on the battery. The battery is kept continuously charged by the motor generator set operated from the regular power lines. The motor generator set is started at regular intervals by an automatic time switch.

Heavy Current Electrode Holder

WITH the coming of heavy current welding, new accessories have been necessary in the arc welding lines of equipment. The accompanying illustration shows a 600-ampere metal electrode holder just brought



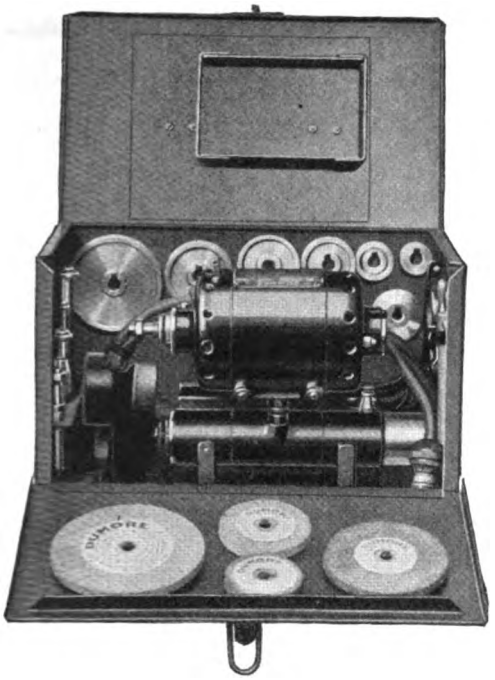
out. This holder handles metal electrode in sizes up ½" diameter and is known as type TR.

Many improvements are claimed for the holder, among them being—replaceable copper jaws, four line contact for the electrode, all copper path for welding current, structural steel construction (maximum strength), light weight with good balance, cool insulated and ventilated handle and shield for protection of the operator's hand.

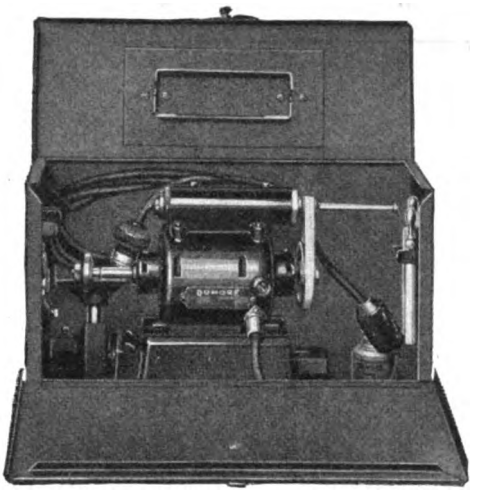
High current, high speed manual welding require holders and accessory equipment designed to permit the operator to get the desired results with the maximum degree of comfort.

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Dumore No. 3 Grinder and Equipment



Dumore No. 2-AG Grinder and Equipment

Now—More Practical Than Ever

ALL No. 2-AG and No. 3 Dumore Grinders are now furnished with a steel carrying case that holds the grinder and all the tool and wheel equipment.

This feature increases the ease of carrying the grinder from one job to another. The wheels and tools are kept with the grinder, saving extra steps and valuable time. The grinder and equipment can be checked in and out of the tool room as one unit and are protected when not in use.

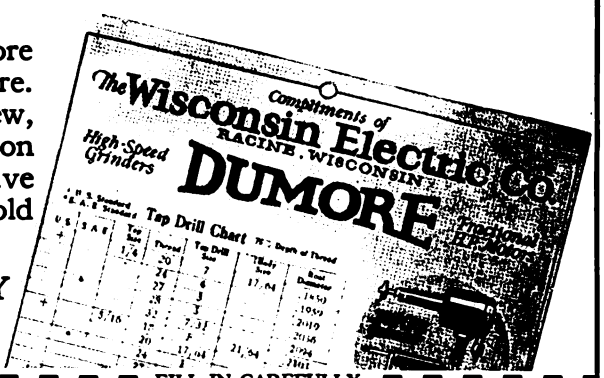
With this new steel carrying case the Dumore Grinder is more practical than ever before. Trade in your old grinders (any make) on new, steel-case equipped Dumores. Mail the coupon for details of our exchange offer. We will give you a liberal trade-in allowance on your old grinders.

WISCONSIN ELECTRIC COMPANY
70 Sixteenth Street Racine, Wisconsin

Dumore Grinder Advantages

There are six Dumore Grinders with individual speed ranges from 3,600 to 50,000 R.P.M. Correct speed without vibration, eliminates taper, bellmouth and chattermarks, common with less efficient tools.

Use the Coupon below, it will bring one of our Tap Drill Charts and complete details of our new exchange offer.



DUMORE

High Speed Electric Toolpost Grinders

Mail the Coupon—It will bring a Free Tap Drill Chart and complete details of our trade-in plan.

FILL IN CAREFULLY

Wisconsin Electric Company, 70 16th St., Racine, Wis.

Please send me Free, a Tap Drill Chart, your latest grinder booklet and tell me what allowance you will make on the Grinder I have now. This grinder is—

(Insert make and model of Grinder you have on this line)

Name.....

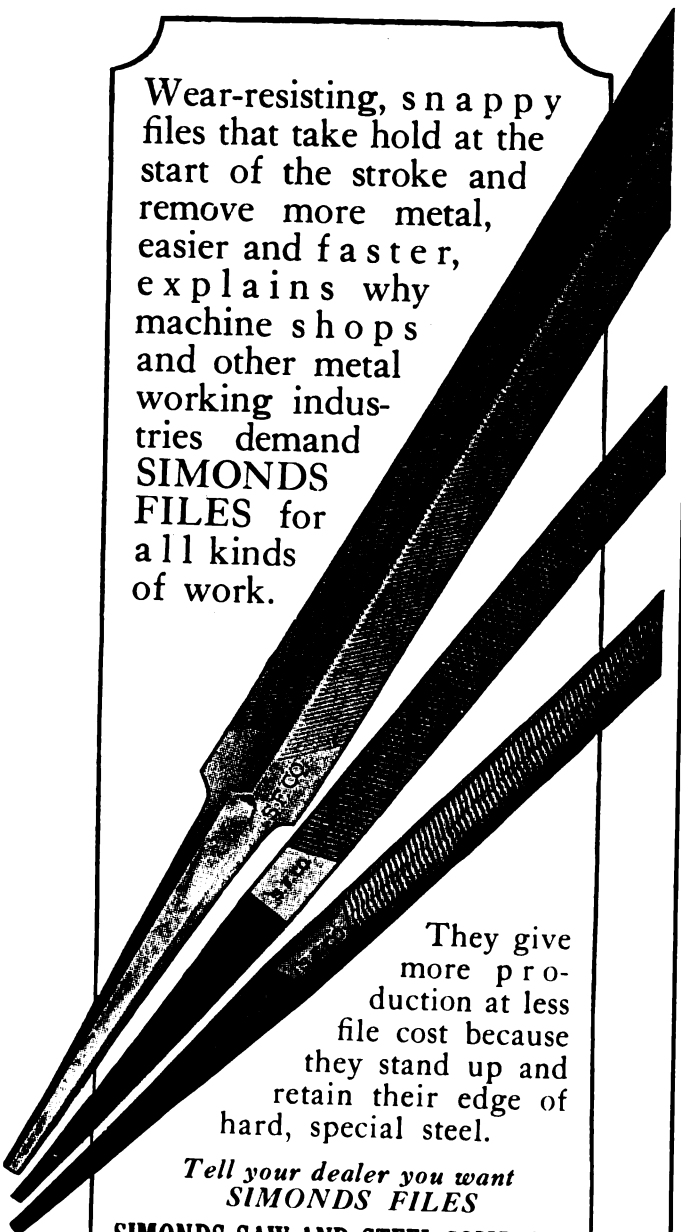
Address.....

City..... *State*.....

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Faster, Easier Filing

Wear-resisting, snappy files that take hold at the start of the stroke and remove more metal, easier and faster, explains why machine shops and other metal working industries demand SIMONDS FILES for all kinds of work.



They give more production at less file cost because they stand up and retain their edge of hard, special steel.

Tell your dealer you want SIMONDS FILES

SIMONDS SAW AND STEEL COMPANY

ESTABLISHED 1832—FITCHBURG, MASS.

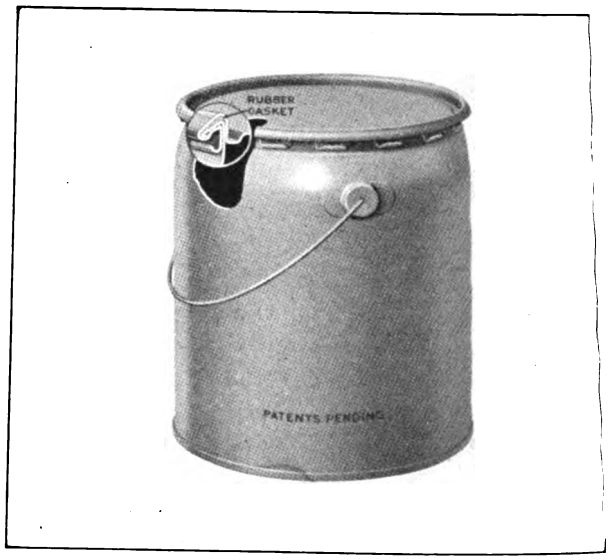
Chicago, Ill.	London, England
Boston, Mass.	Portland, Ore.
Detroit, Mich.	San Francisco, Cal.
New Orleans, La.	Seattle, Wash.
New York City	Montreal, Que.
Lockport, N. Y.	Toronto, Ont.
Memphis, Tenn.	Vancouver, B. C.
Atlanta, Ga.	St. John, N. B.

SIMONDS FILES For Industry

Packing and Shipping

New Shipping Container for Paints and Compounds

A SHIPPING container that has many advantages for shippers is in the form of a pail having straight sides with a gentle inward slope beginning a short distance below the top. Since the top does not protrude beyond the sides, any blow or shock is taken by the body of the pail and not transmitted to the cover. An important advantage of this pail is the fact that one can be stacked directly on top of another with the sides of adjacent columns touching. No staggering or off-setting to secure a steady stack is necessary. From the shipper's standpoint a direct saving is made by the greater number of these containers that can be shipped per car and the time and labor required for chocking and blocking to insure a non-shifting load is saved.

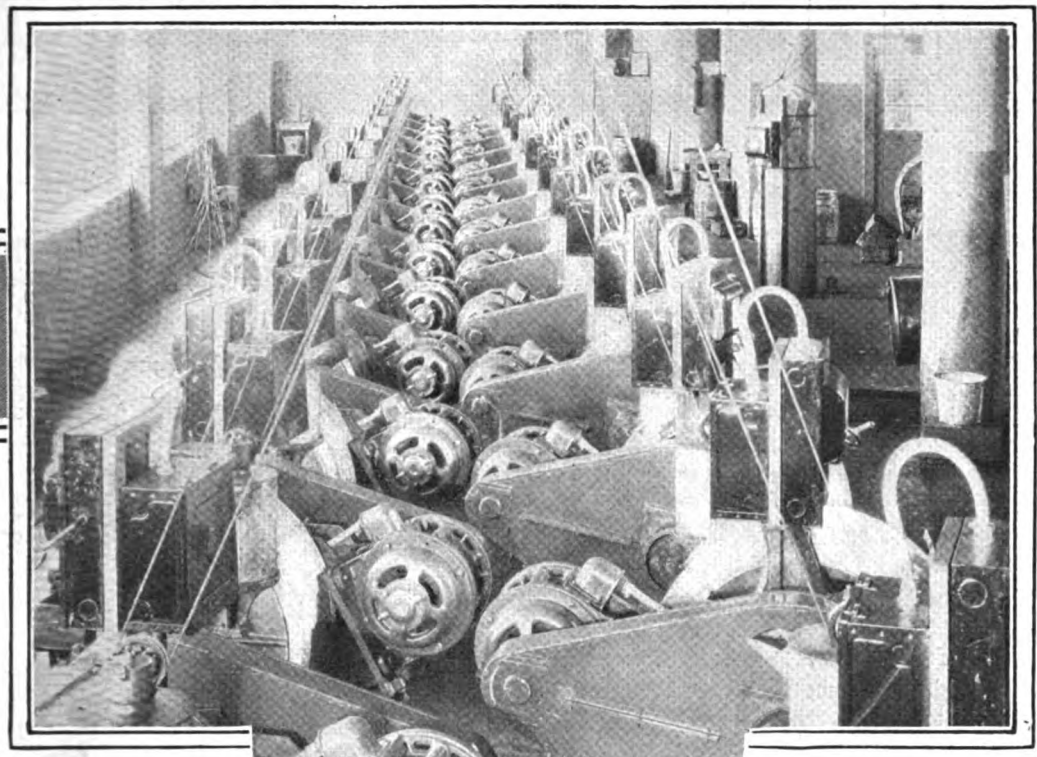


The top is put on and sealed in place by a special machine furnished the user by the manufacturer. A machine-cut, one-piece gasket of special composition rubber is compressed between the lid and the upper rim of the can by the sealing operation. A unique method of clamping holds the lid solidly in place. The design is such that any outside blow tends to seat the cover tighter. In strenuous tests it has been found practically impossible to produce a leak between the pail and its cover. A distinct advantage of this method of sealing and the design of the top is that the contents are sealed air-tight and arrive at destination in the same condition as when shipped.

For food products, soda fountain supplies, lacquer enamels, etc., the containers can also be furnished with hot-tinned or hot galvanized interior coating. Standard sizes are now available from 2½ to 6 gallon capacity.

For ...vertised in this issue write Industry Illustrated

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New Departure Ball Bearing equipped electric motors were specified on this job because: First, annual lubrication is sufficient; Second, motor feet can be mounted at the unusual angle shown; Third, the driven machines can be mounted closely together on the floor, as easy access to the motor is not necessary.

New Departure Advantages and Economies Are Money Savers in Electric Motors

Electric motors equipped with New Departure Ball Bearings operate without friction and without wear continuously and uninterruptedly, requiring lubrication only once in 9 to 12 months.

Because of these superior advantages production is increased at a substantial reduction of maintenance cost proving that New Departure Ball Bearings are more economical than any other type of anti-friction bearing.

Write for copy of "Cutting Your Costs," non-technical treatise on the application of ball bearings to electric motors; also, "Booklet K," technical treatise on the same subject. Either or both sent on request.



The New Departure Manufacturing Company

Chicago BRISTOL, CONNECTICUT Detroit

New Departure Quality Ball Bearings

583

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WILLIAMSPORT

Sudden Stresses on these 12 foot Austin Graders with a 10 ton Tractor is a test for

WIRE ROPE!

Good Road builders cannot be bothered with Wire Rope of uncertain quality and they cannot afford to guess, so

AUSTIN MANUFACTURING CO.

Equip with *WILLIAMSPORT*—The Factory Certified, Telfax Marked Wire Rope —and thus make ***sure*** of both quality and strength.

You too may get this protection—you cannot afford to do without it.

RELIABLE Manufacturers are becoming CONVINCED that guess work for the purpose of saving a few nickels is poor business efficiency.

Good Engineers just won't endorse such a program.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works:
WILLIAMSPORT, PA.

General Sales Offices:
PEOPLES GAS BLDG.
CHICAGO

Use Madesco Tackle Blocks
They Stand the Gaff



TELFAX TAPE MARKED **WIRE ROPE** FACTORY CERTIFIED

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The Difference Between Little Fires and Big Fires

100 ...cal fires ...t remained ...e because ...e plants were sprinklered.



100 typical fires that became big because there was no sprinkler protection.

70 were extinguished by the sprinklers with only nominal damage

43 plants did not resume operations

14 sustained a loss of credit rating of 50 to 66%

17 no longer furnished financial statements

26 were ...by ... lers ... help...

26 were unaffected as to credit rating, but lost in other ways

A sprinkler system served by a dependable elevated tank often means the difference between a little fire and a big one. No one can absolutely prevent the possibility of fire starting in his plant but by maintaining a gravity pressure on sprinkler heads throughout the buildings he can prevent its rapid spread. The battle with fire is won or lost in the first few minutes.

Horton Tanks are the economical means of insuring an adequate water supply at ample pressure. They are long lived and require practically no maintenance. The difference between a big fire and a little fire would justify this protection for your plant. Ask our nearest office to quote on a tank suitable for your need.

Chicago Bridge & Iron Works

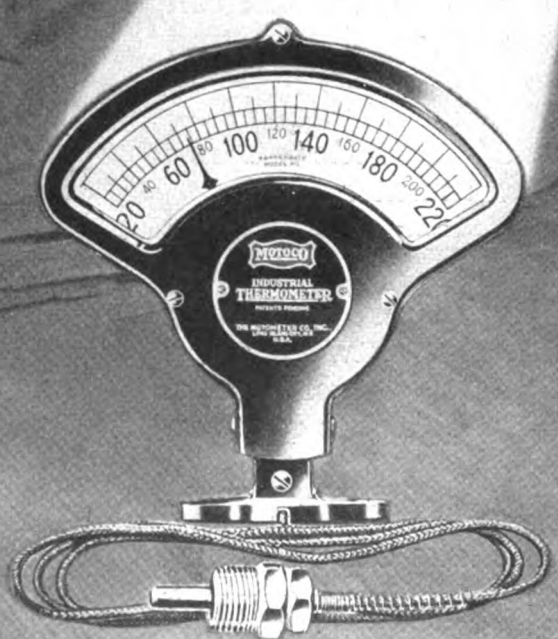
Chicago	2465 Old Colony Bldg.
New York	3121 Hudson Terminal Bldg.
Cleveland	2207 Union Trust Bldg.
Dallas	1624 Dallas National Bank Bldg.
Atlanta	1034 Healey Bldg.
San Francisco	1047 Rialto Bldg.

...ORTON TANKS

II7-Gray

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BRINGS THE TEMPERATURE TO YOU



MOTOCO
INDUSTRIAL THERMOMETER
may be obtained in various ranges between Minus 40 F and Plus 750 F

From the Hard-to-get-at Location

THE modern, easy and efficient method of checking the heat content of substances in mixing vats, process kettles or vacuum pans is this:

Let Motoco Industrial Thermometers bring the temperature to you. Do not go to the hard-to-get-at location yourself—read the indication easily and accurately at a point where it is most convenient and where the light is good.

The special star-shaped cross-section of the Motoco capillary tubing transmits the exact heat message of the metal bulb with unfailing accuracy to the dial, without being affected by the temperature of the surrounding atmosphere. Consequently, Motoco readings are always reliable.

Catalog No. 9 contains a complete and interesting explanation of Motoco temperature indicating methods. Send for your copy to-day.

The MotoMeter Company, Inc.
9 Wilbur Ave., Long Island City, N. Y.
Chicago Office, 820 Tower Court
National Gauge & Equipment Division, La Crosse, Wisc.
The MotoMeter Co. of Canada, Ltd., Hamilton, Ont.

The Industrial Division offers the services of its Engineering staff to manufacturers requiring thermometer equipment. The National Gauge & Equipment Division offers a similar service on various types of pressure gauges.

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Reducing Speed Dependably



SVR, single reduction speed reducers up to 150 hp., 8:1 ratio.

NUTTALL speed reducers are built to handle the toughest jobs. Every part is designed and constructed to carry its portion of the load. Simply constructed, with but few parts to wear and get out of order, Nuttall speed reducers can be depended upon.

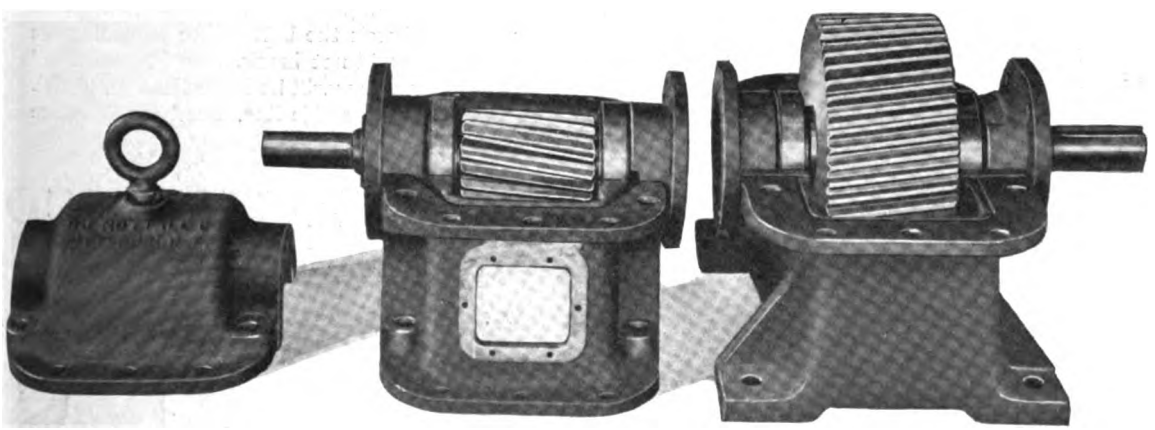
Smooth operating, helical gears; heat treated and hardened to give them still greater strength; Timken roller bearings; a rigid, ribbed case; and the Nuttall system of positive splash lubrication are all combined to give a speed reducer which will operate continuously with no attention beyond the occasional addition of oil to the case.

Nuttall speed reducers are available in single reductions, (SVR series), up to 150 h. p., and ratios of 8:1; in double reductions, (DVR series), up to 200 h. p., and ratios of 30:1.

Send for our Bulletins

R. D. Nuttall Co., Pittsburgh, Pa.

Philadelphia Chicago Wilkes Barre
Los Angeles Houston Salt Lake City
Canada, Lyman Tube & Supply Co., Montreal



Nuttall

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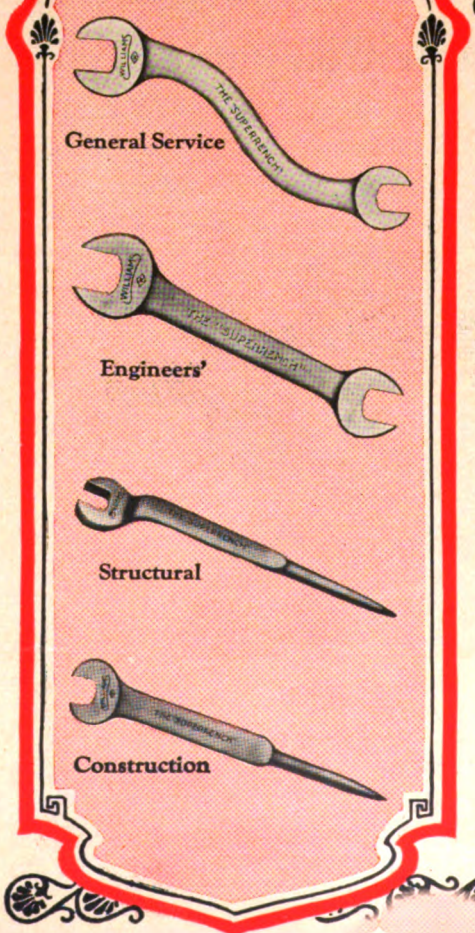


The wave of a magic wand

wont pile up business profits

NO, SIR! There's no hocus-pocus in this business of selling wrenches. It's a case of prove the facts you claim; and the man who handles The "SUPERRENCH" (Chrome-Molybdenum steel) can do it every time.

They're longer, thinner, narrower-jawed than ordinary wrenches, yet far stronger. That's the claim we make, and here's how we back it up—"Superrenches" will strip the thread of any standard nut or break the bolt before spreading the jaws. Furthermore, they will not break. Any "Superrench" that does not meet these claims will be immediately replaced. It will pay you to investigate this line. Send for literature today.



J. H. WILLIAMS & CO.

"The Wrench People"

New York BUFFALO Chicago

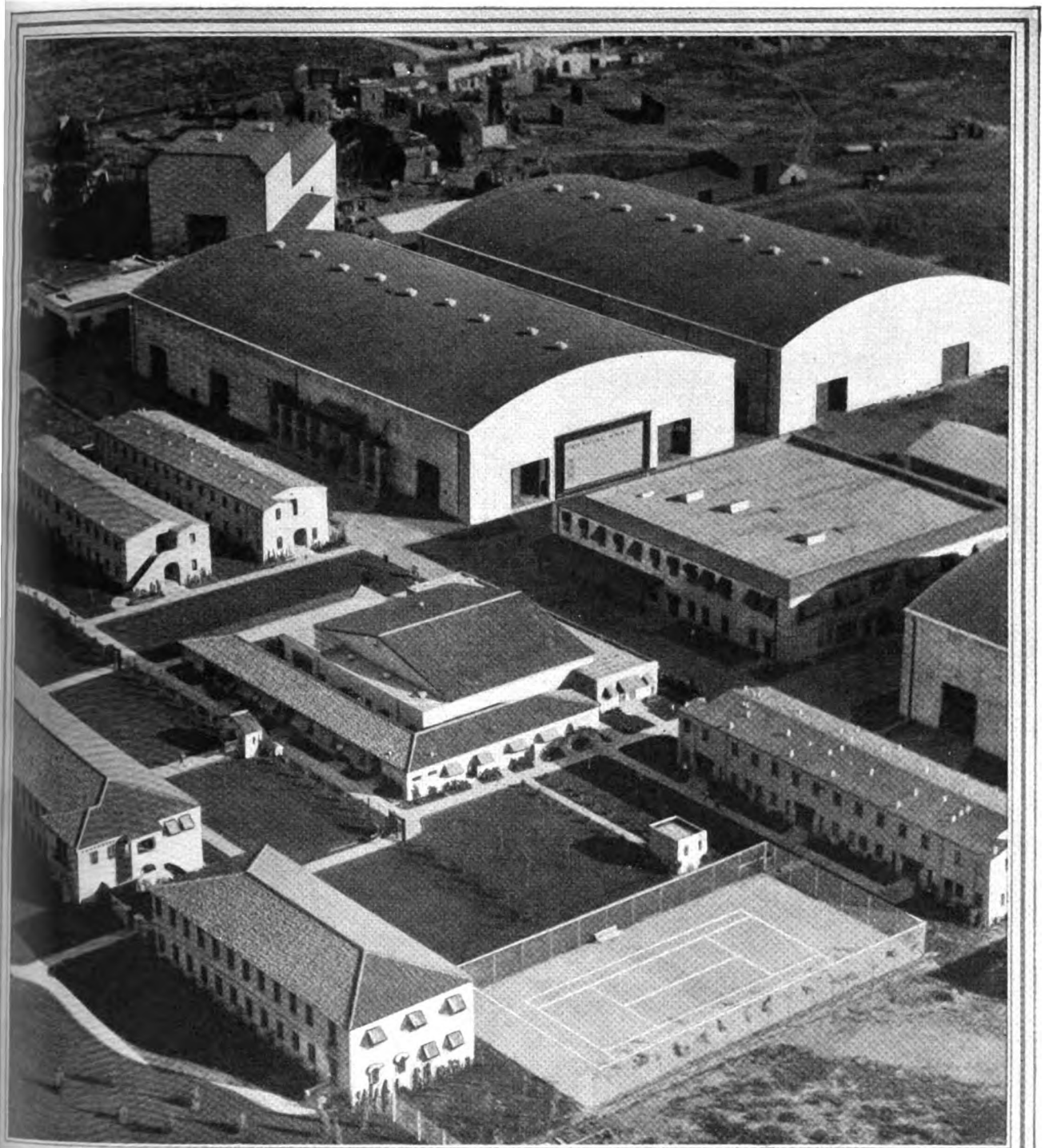
WILLIAMS

SUPERIOR DROP-FORGED TOOLS

"SUPERRENCH"

(Chrome-Molybdenum)

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FIRST NATIONAL PICTURES CORPORATION, BURBANK, CALIF. THE AUSTIN COMPANY, BUILDERS

Every plant has its individual lighting and ventilating problems. And the modern moving picture plant is no exception, as a study of this great Burbank, Calif., plant of the First National Pictures Corporation will show. ' ' ' Here will be found over twenty separate buildings, all Fenestra-equipped for correct lighting and ventilating—not one problem but many different problems solved by Fenestra men to meet a wide variety of lighting and ventilating conditions. Over 20,000 sq. ft. of Fenestra Steel Windows were used. ' ' ' Like all other Fenestra Pacific Coast operations, this work was handled by the local Fenestra organization, independent of main office supervision. There are similar Fenestra organizations in every part of the country, each one complete in itself, ready to apply years of experience to your window problems wherever your new buildings may be located. When it's a question of windows, contact with Fenestra.

Fenestra WINDOWALLS

DETROIT STEEL PRODUCTS COMPANY, 2305 EAST GRAND BOULEVARD, DETROIT, MICH. FACTORIES: DETROIT, MICH., OAKLAND, CALIF., AND TORONTO, ONT., CAN.

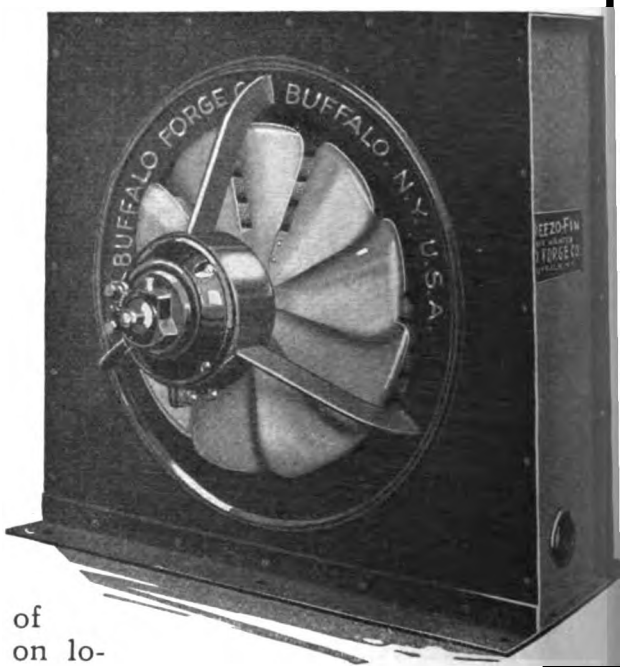
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Lower costs — higher efficiency

Buy the highest heating efficiency at the lowest cost—get easily installed, inexpensively maintained HEATING, at a fraction the cost of direct radiation.

Heat with Buffalo Unit Heaters





FOUR TYPES—

for every requirement

Buildings have certain general characteristics which determine the best type of heater, depending on location of windows, height of ceilings, production methods, etc.

We make four types of unit heaters to meet all of th conditions economically. Why not let us work with you selecting the right heaters for your buildings?

Ask for Catalog No. 466.

Buffalo Forge Compan

440 Broadway Buffalo, N.

In Canada, Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

HEAT WITH UNIT HEATERS

"Buffalo" Unit Heaters

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Speed!



Three Dominant Features (SPEED — POWER — EASE OF OPERATION) **place the New Clipper No. 8 Speed Lacer in a class by itself.**

SPEED: **This new machine laces both ends of any belt up to 8 inches in width in 1 ½ minutes.**

POWER: **45,900 pounds pressure, the weight of 300 men is developed by a new principle.**

EASE OF OPERATION: **One man operates it easily.**

Weight 100 pounds. Price on application.

Every lacing requirement is anticipated by the Clipper Belt Lacer Company. The use of Clipper Products is an assurance of increased production, efficiency and economy in plant operation.

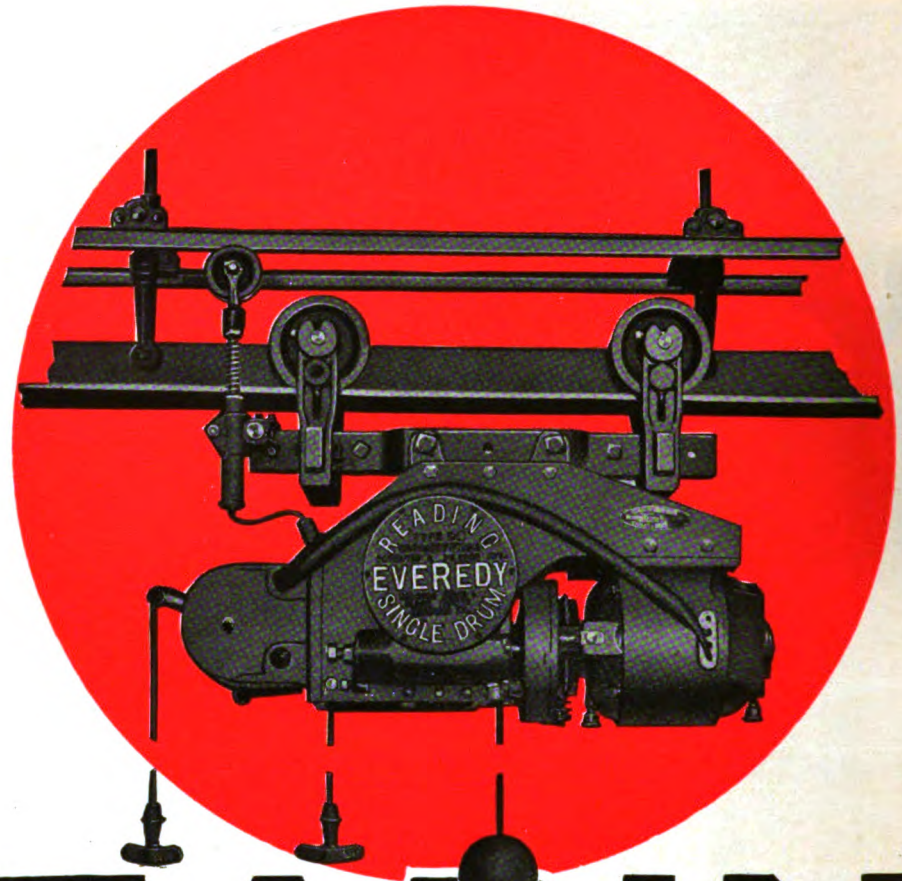
QUALITY BELT LACING

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

Clipper

No 8 Speed Lacer

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READING

for a Profitable Solution of Handling Problems

Let us assist you in cutting down the handling cost in your plant. READING Products offer you the best there is in material handling equipment. They have made good for over a quarter of a century under the use and abuse of skilled and unskilled operators. Today, there are thousands of satisfied users.

We not only have high grade, dependable products but are in position to furnish a complete system, including cranes, hoists, trolleys, etc., which means a saving of money you ordinarily would be called upon to pay out as profit to other manufacturers.

May we send you a complete set of catalogs, illustrating and describing READING products.

COMPLETE MONORAIL SYSTEMS
(HAND OR ELECTRIC POWER)

Standardize on READING'S full line of Electric Hoists, Cranes, Multiple Gear Hoists, Trolleys, etc. You'll find it pays!

Reading Chain & Block Corporatio

Reading, Pennsylvania

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OSBORN



1779—Wire Scratch Brush. Made with curved back. For removing paint, varnish and rust.

Osborn Wire Brushes Scientifically Treated

Osborn Wire Scratch Brushes are scientifically treated to assure a permanent cutting quality. As is true of all Osborn better-wearing brushes, they are built *specifically* for the job.

In addition to the special treatment of the wire, they are also skilfully shaped to make working easier and quicker.

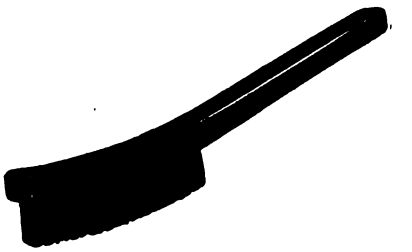
For removing paint and varnish, cleaning wood, stone, brick, metal, iron-work, foundry castings and rubber, select wire scratch brushes bearing the Osborn trademark for the utmost in efficiency and economy.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED

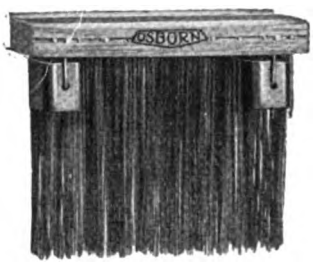
5401 Hamilton Ave. Cleveland, Ohio

Branch Offices:
New York Detroit Chicago San Francisco Los Angeles

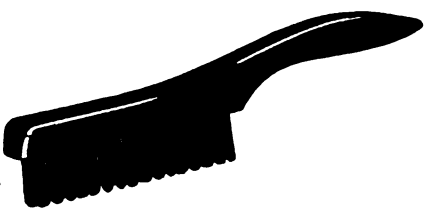
Osborn Brushes



1777—Steel Wire Scratch Brush. A narrow brush for pattern makers' and braziers' finishing work, cleaning architectural iron work, figured brass and small castings. Size ¾" wide, length over all 14", length of wire 1 11/16".



28—Bridled Casting Brush. This brush contains more wire than the ordinary casting brush. Heavy sheet iron bridles minimize vibration and reduce breakage of end wires. Will give 2 to 3 times the length of service.



1781—Wire Scratch Brush. Standard Shoe Handle Brush for household, auto or factory use.



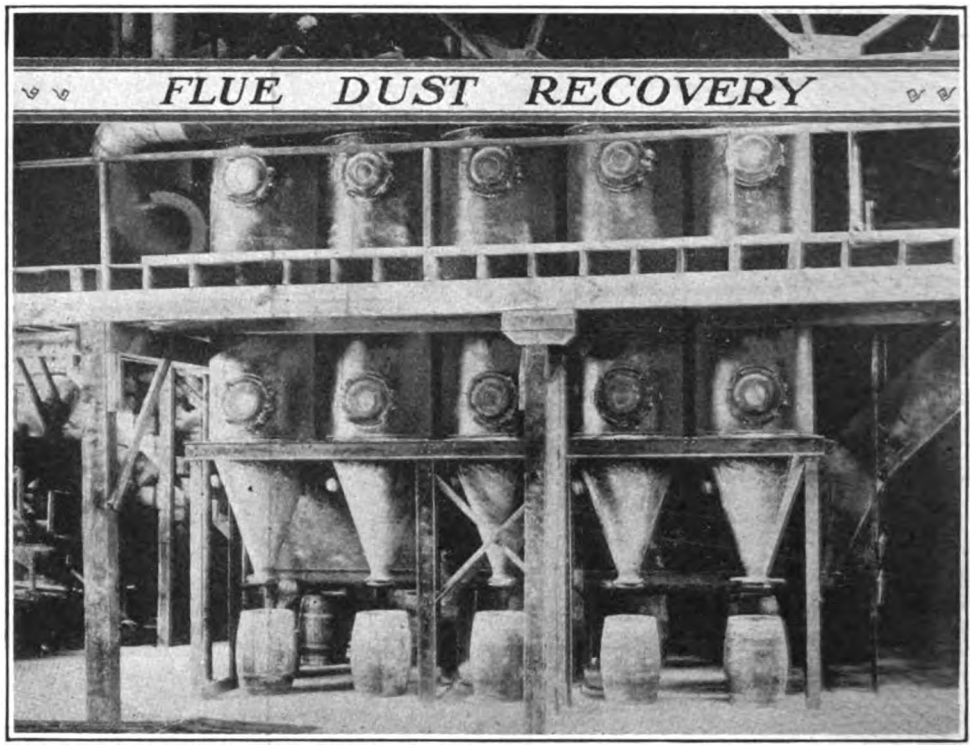
1780—Wire Scratch Brush. Straight back brush with extra long wires for general use. The wire used in Osborn Scratch Brushes is the first quality tempered steel, drawn especially for scratch brush use.



7—Plain Wire Casting Brush. Made of Special Tempered flat steel wire—Very strong and durable. Made in several sizes.

BETTER WEARING BRUSH FOR EVERY USE

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Not only recovers values but uncovers hidden profits—DRACCO

Dust and fumes have always been considered dangerous from the standpoint of fire hazard but the values which a large number of progressive manufacturers are recovering with the Dracco System is fast paying for their equipment.

In many instances better than 99% of all values are recovered. The Dracco method is automatic, one man can easily take care of the average installation. Clean, pleasant work rather than dirty, disagreeable labor and less of it, means a substantial decrease in labor cost.

Dracco is installed in your plant only after a thorough study of your needs. Our engineers then determine the equipment necessary to accomplish the desired results and specify accordingly.

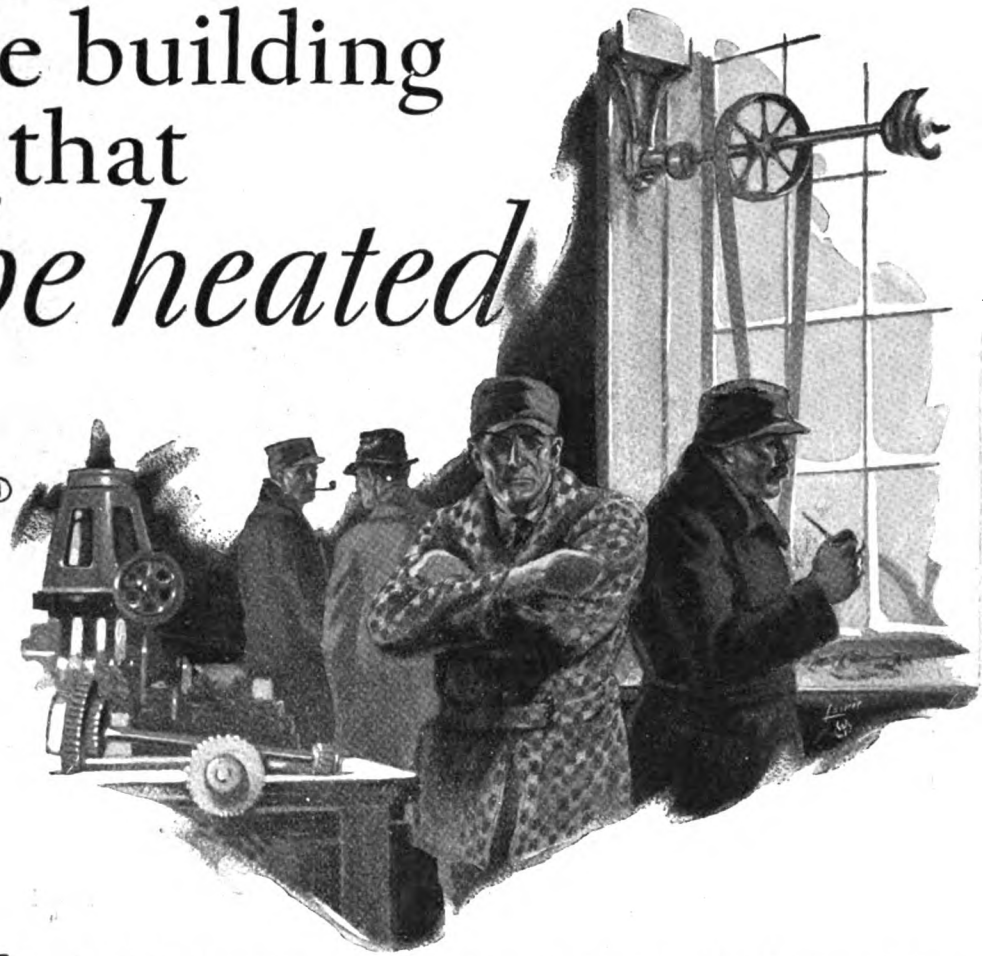
We would be pleased to have you see one of our systems in operation. Undoubtedly there is one near you. Write and we will direct you to a nearby installation. Many manufacturers have uncovered profits with Dracco, it may do the same for you. It costs nothing to investigate this modern dust and fume recovery method.

THE DUST RECOVERING & CONVEYING CO.
Engineers and Manufacturers
CLEVELAND, OHIO

DRACCO DOES IT

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For the building that *Can't be heated*





For the building "too old" to be heated—for the mammoth amphitheatre that simply "can't" be heated—for the temporary structure that wasn't even built to be heated—for the new modern plant with acres of floor space, thousands of windows, high ceilings, and crane housings, there is the Venturafin Method of Unit Heating.

Some of the many benefits of the Venturafin Method of Unit Heating are heat control—the elimination of cold spots—a complete air circuit—heat losses reduced to a minimum—and a more even distribution of heat. It is ideal, too, as an auxiliary unit for cold corners and out of the way places.

Venturafin gives more than five times the efficiency of steam coils, radiators, etc.—has $\frac{1}{10}$ the weight—occupies $\frac{1}{4}$ the space—costs less than ordinary radiation, and can be employed wherever steam is available. Over 15,000 in use.

Mail the coupon today—no obligation—or ask your heating contractor for the facts on Venturafin.

AMERICAN BLOWER CO., DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO CO., LTD., WINDSOR, ONT.

Venturafin consists of the following major parts: (1) Copper fin-heater—with five times the radiating efficiency of ordinary iron coils, (2) The famous American Blower Ventura Blower (electrically driven), (3) Air recirculating box.

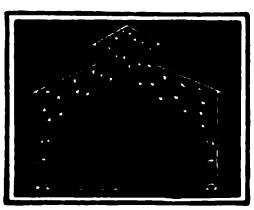
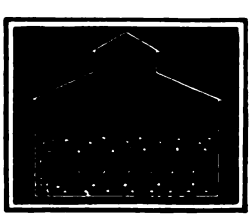


Diagram above shows how heated air rises from radiators, steam coils, etc.



This diagram shows how Venturafin Method distributes heat *evenly* in working areas.

© A.B.Co. 1927 (632)

American Blower

VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

C O U P O N

AMERICAN BLOWER CO., DETROIT, MICH.
Send details relative to the application of (63) The Venturafin Method of Unit Heating to

*Name*_____

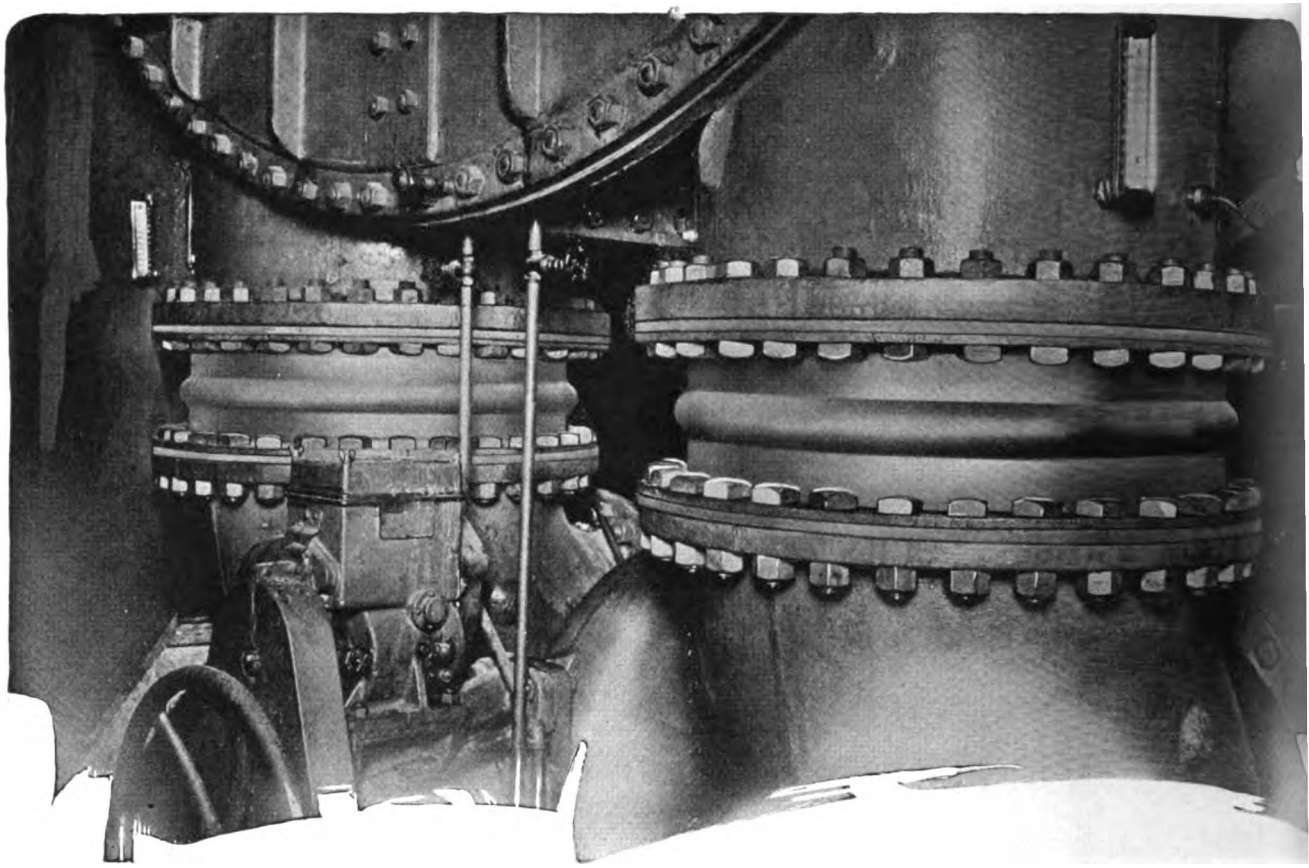
*Address*_____

*City and State*_____

*Type and size of building to be heated*_____

E A T W I T H U N I T H E A T E R S

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NO METAL FATIGUE

—with "U. S." Rubber Expansion Joint

Metal fatigue or crystallization in joints is prevented by installi "U. S." Rubber Expansion Joints. The flexibility and resilien of the rubber arch in the "U. S." Joint practically eliminates t destructive action of vibration, expansion and contraction in pi lines. The throb of pump pulsations so common in many plan is deadened when "U. S." Rubber Expansion Joints are used.

Designers of modern power plants specify "U. S." Rubber Expa sion Joints on the circulating water lines where the water pressu does not exceed 50 pounds or where the temperature is not mo than 180° F. These joints are also used on vacuum lines betwe turbines and condensers. For long successful performance in yo plant, install "U. S." Rubber Expansion Joints.

"U. S." Rubber Expansion Joints are built in various shapes and sizes from 3 inches to 72 inches.

Every engineer should have a copy of "A Handbook of Rubber Expansion Joints." Write for one today.

United States Rubber Company

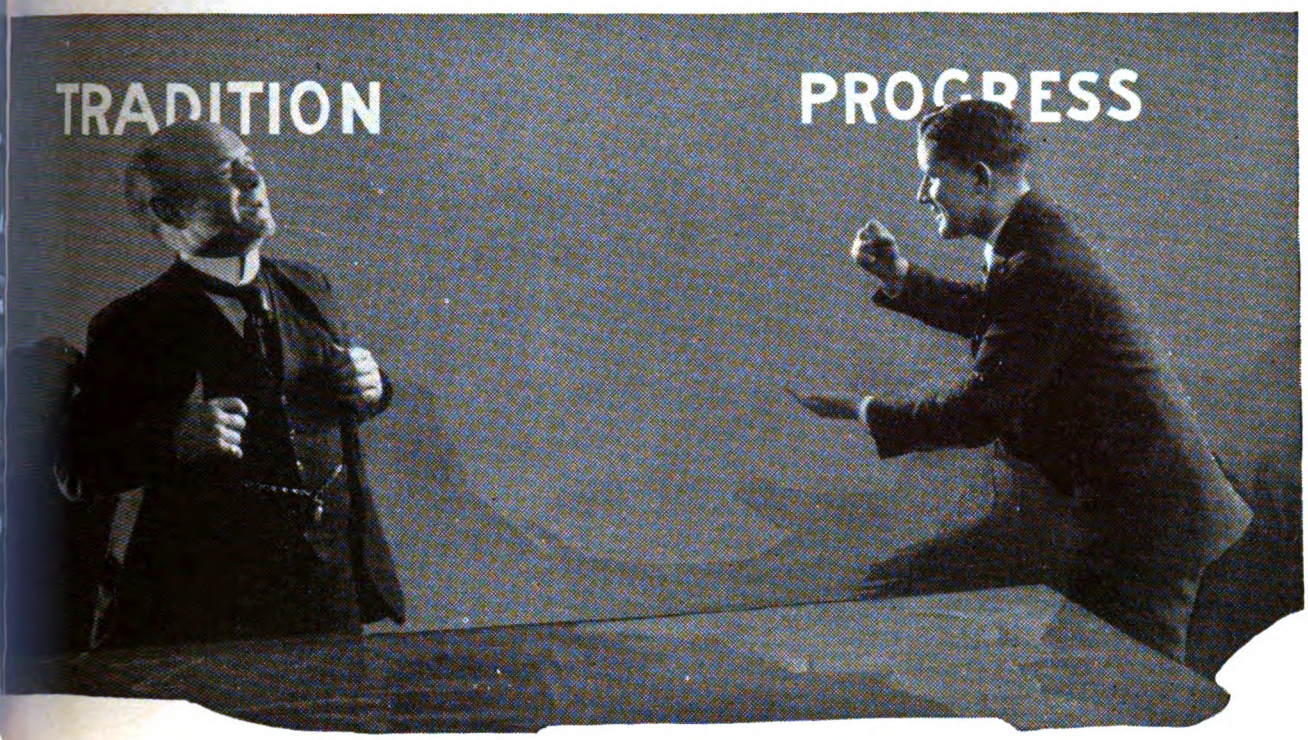
1790 Broadway Trade US Mark **New York City**

Branches in Every Industrial Center

"U.S." Rubber Expansion Joints

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Is Pop "Sitting Pretty" or Standing Still?



"Listen, Lad—

we're 'sitting pretty' on this year's production. I've got all our contracts fixed up with the foundries and the rivet makers, and the pattern shop—everything buttoned up tight."

"Yes, Pop—

but the button is on a loose thread. Isn't it loose business to pay three times as much for castings as for steel—when steel Stable-Arc welded is stronger?

Isn't it loose business to weaken our sheets by punching them full of holes and riveting them up to a 50% joint—when Stable-Arc welding will give you a 100% joint?

Isn't it loose business to pay for patterns—when Stable-Arc welding can be done from a sketch?

Isn't it in Henry VIII where it is said:

'Where you are liberal of your loves and counsels

Be sure you be not loose'?

Why not loosen up for that book on Arc Welding?"

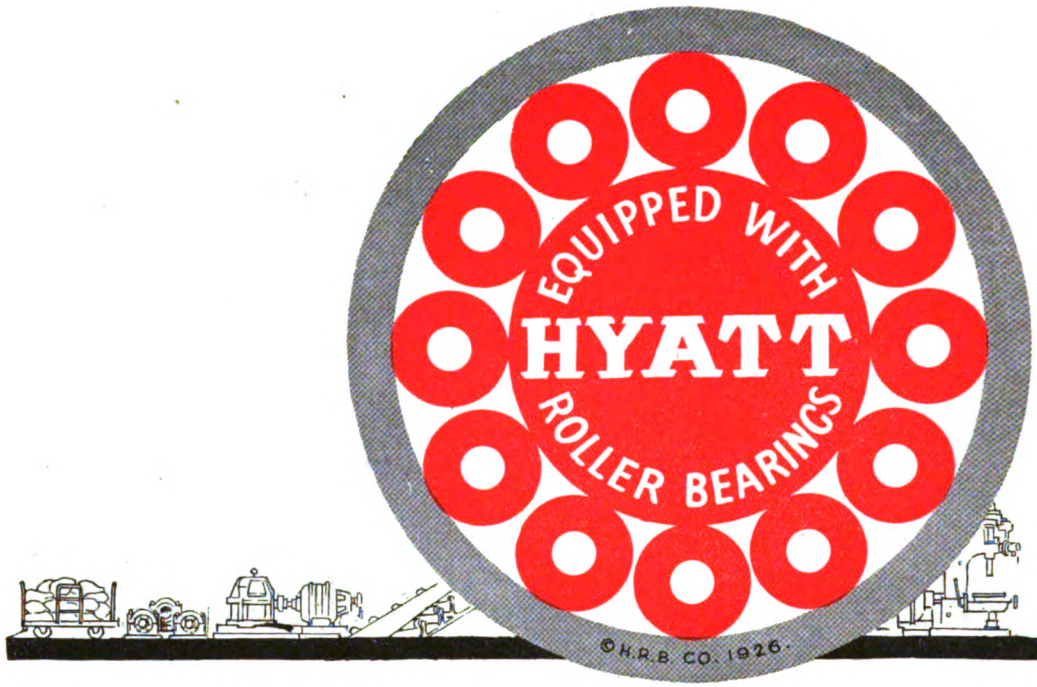
The Lincoln Electric Co., Dept. No. 18-7, Cleveland, Ohio

WC-18



"Stable-Arc" LINCOLN WELDER

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This is the *Mark of Hyatt Protection.* A red symbol with a gold border—your assurance of bearing satisfaction.

The Mark of Bearing Protection

Hidden away in vital parts of industrial equipment—guarding permanently against friction and wear—saving power—minimizing maintenance—adding many extra years of better service life—Hyatt Roller Bearings have made their presence known only through the economies they effect.

Manufacturers, proud of Hyatt performance in their products, have asked for an outward mark to indicate the use of these better bearings. The "Mark of Hyatt Protection," reproduced above, was then developed.

This mark is now being used by many who employ Hyatt Roller Bearings, and as time goes on more manufacturers will adopt it so buyers can tell at once that their equipment is Hyatt-protected.

HYATT ROLLER BEARING COMPANY

Newark Detroit Chicago Pittsburgh Worcester
Philadelphia Oakland Cleveland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

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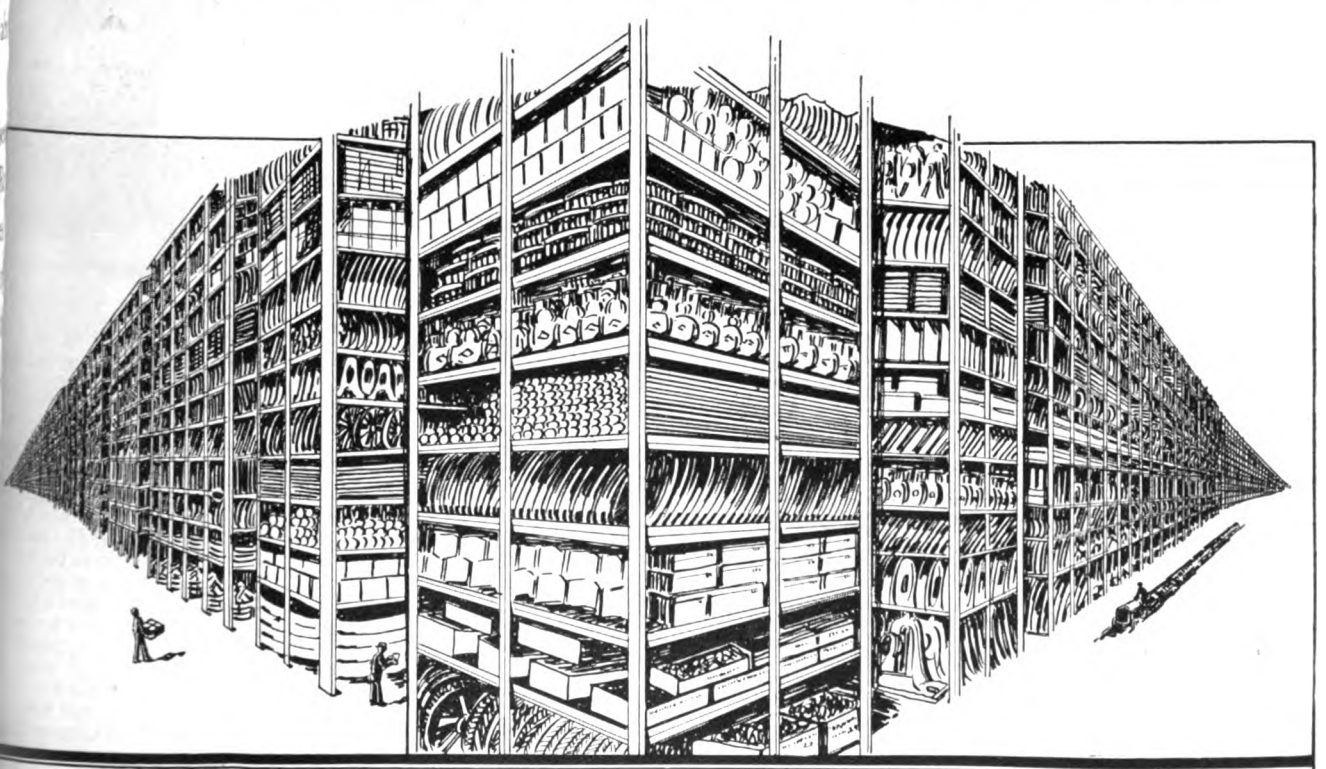
The Logical Source of Supply for Industrial Machinery, Tools and Equipment

ARE you fully acquainted with the service that the Machinery and Mill Supply Distributor can give you? Do you know that the average distributor has been in business from 25 to 50 years; that his investment represents many thousands of dollars? You will find that in nine out of ten cases his capital investment represents over one million dollars.

Many distributors have 10, 15 or more salesmen on their payroll ready to give you more than your share of service. They maintain enormous stocks in their warehouses which guarantee that almost any of your requirements—transmission, machinery, power equipment, machine tools, shop tools, maintenance supplies or, in fact, anything used in the mill, shop and factory can be obtained from stock at short notice.

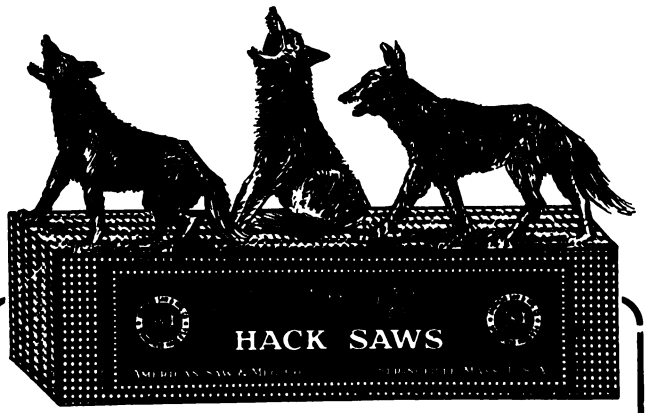
It will pay you to get better acquainted with the distributor and his service.

Buy from the Machinery and Mill Supply Distributor



One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor

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Try a Pack of

LENOX WOLVES

for Better Cutting Qualities

You will know that LENOX WOLVES live up to the reputation established by their namesakes, the "Wolves of Lenox." These wolves, with their strong, clean-cutting teeth, were a menace, many centuries ago, to the brave little clan MacFarlane, founded by the Earl of Lenox.

The Modern Wolves of Lenox—Lenox Hack Saw Blades in the plaid box—with teeth that go through the toughest metal with a cut as straight, even and clean as the teeth of wolves, give longer service and better cutting qualities.

Try a pack of LENOX WOLVES and compare them with other hack saw blades. You will soon know the difference.

American Saw & Mfg. Co.,
Springfield, Mass.



"The Tools in the Plaid Box"

Triple Convention Brings Results

THE convention voyage on the "S. S. Noronic" apart from its success as an exchange for ide has brought about a closer coöperation between the thr associations which took part. They were: The Nation Supply & Machinery Distributors' Association, T Southern Supply & Machinery Dealers' Association, a The American Supply & Machinery Manufacture Association.

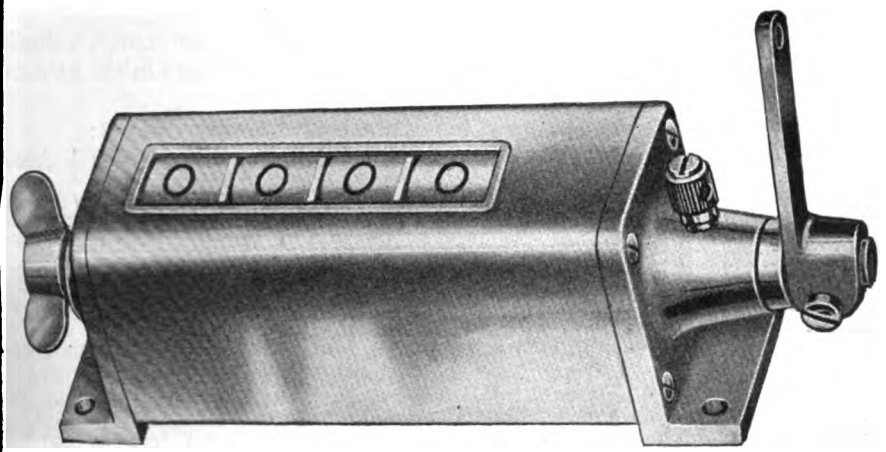


S. S. Noronic of the Northern Navigation Company, upon w the convention was held.

A Mill Supply Council was created, consisting of members from each of the three associations represe at this convention. The Council is to meet not less t four times a year. It is to function in the interest closer coöperation among the members of the three a ciations. It was further moved

"that the Presidents of the three Associations act jointly, w out delay, to prepare a platform for the operation of the Supply Council, which when prepared be submitted to the m bers of the Mill Supply Council for approval and suggest and as soon as a platform is prepared, it be submitted t proper governmental and legal authorities for approval; which a meeting of the Mill Supply Council is to be calle adoption of a platform of operation, and the actual wor the Mill Supply Council begin, and further, that the Secr of the joint meeting of the Executive Committees and the Supply Council of The National Supply and Machinery tributors' Association, Southern Supply and Machinery De Association and The American Supply and Machinery M facturers' Association, held aboard the 'S. S. Noronic,' T day, June 16th, is instructed to send a copy of the above re tion to the Secretary of each of the three Associations; to be submitted to their members with request for sugges and recommendations, to be made to their respective Presi

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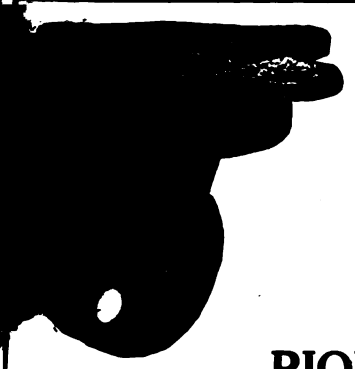
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American Woolen Co	Crown Willamette Paper Co.
A., T. & S. F. R R. Co.	Delaware & Hudson Co.
Barnhardt Mfg. Co.	Georgia Vitrified Brick & Clay Co.
B. & O. Railroad Co.	Harris Automatic Press Co.
Best Foods Co., Inc.	Kansas Gas & Electric Co.
Eastman Kodak Co.	Libby, McNeil & Libby Co.
Elmwood Castings Co.	Merchants Refrigerating Co.
Gates Rubber Co.	Nashua River Paper Co.
Hercules Powder Co.	New Haven Pulp & Paper Co.
Lane Mfg. Co.	Pacific Gas & Electric Co.
Lone Star Gas Co.	Pittsburgh Valve & Fittings Co.
Monarch Mills	Prest-O-Lite Co., Inc.
Novelty Hosiery Co.	Roessler & Hasslacher Chemical Co.
Pacolet Mfg. Co.	Shell Co. of California
Pelham Mills	Texas Power & Light Co.
Pepperill Mfg. Co.	U. S. Radiator Corp.
Reading Iron Co.	University of California
Southern Pacific R.R.	West Virginia Pulp & Paper Co.
Swift & Co.	Western Maryland Ry. Co.
Waterbury Mfg. Co.	Woodside Cotton Mills Co.

Tell us what kind of roof you have and its area, and we will gladly quote you price.

The Arco Company

Paints ~ Varnishes ~ Enamels

CLEVELAND, OHIO

[Eclipse Division]

for their guidance in submitting a platform of operation for the Mill Supply Council."

It is expected that the work of the council will unify what have hitherto been isolated efforts in the interest of the industry.

The members of the council are as follows:

National Supply & Machinery Distributors' Association—

E. P. Welles, Charles H. Besley & Co., Chicago, Illinois; George Puchta, The Queen City Supply Company, Cincinnati, Ohio; H. W. Strong, The Strong, Carlisle & Hammond Company, Cleveland, Ohio; W. J. Radcliffe, The E. A. Kinsey Company, Cincinnati, Ohio; B. H. Ackles, The Rayl Company, Detroit, Michigan.

Southern Supply and Machinery Dealers' Association—

T. C. Keeling, Nashville Machine & Supply Co., Nashville, Tenn.; L. J. Larzelere, Farquhar Machinery Company, Jacksonville, Fla.; W. W. Doe, Alabama Machinery & Supply Co., Montgomery, Ala.; D. D. Peden, Peden Iron & Steel Company, Houston, Texas; Alvin M. Smith, Smith-Courtney Company, Richmond, Va.

American Supply & Machinery Manufacturers' Association—

Robert B. Skinner, The Skinner Chuck Co., New Britain, Conn.; D. S. Brisbin, The Columbus McKinnon Chain Co., Columbus, Ohio; W. C. Henning, A. Leschen & Sons Rope Co., St. Louis, Mo.; F. H. Payne, Greenfield Tap & Die Corporation, Greenfield, Mass.; J. H. Williams, J. H. Williams & Co., Buffalo, N. Y.

The convention also proceeded with the election of officers for the coming year:

New Officers of the National Supply & Machinery Distributors' Association—

President, Edward P. Welles, Charles H. Besley & Co., Chicago; Vice-President, H. H. Kuhn, Hardware & Supply Co., Akron, Ohio; Secretary-Treasurer, George A. Fernley, Philadelphia; Executive Committee, E. B. Hunn, C. S. Mersick & Co., New Haven, Conn.; and L. A. Clark, Samuel Harris & Co., Chicago.

New Officers of Southern Supply and Machinery Dealers' Association—

President, T. C. Keeling, Nashville Machine & Supply Co., Nashville, Tenn.; First Vice-President, W. W. Doe, Alabama Machinery & Supply Co., Montgomery, Ala.; Second Vice-President, D. D. Peden, Peden Iron & Steel Co., Houston, Tex.; Executive Committee, L. J. Larzelere, Farquhar Machinery Co. Jacksonville, Fla. (Chairman), Philip Pidgeon, Pidgeon, Thomas Iron Co., Inc., Memphis, Tenn., C. W. Beckner, West Virginia-Kentucky Hardware & Supply Co., Huntington, W. Va., C. J. Salm, Dixie Mill Supply Co., Inc., New Orleans.

Monel Metal in Valves

By W. F. Schaphorst

IN important power stations it is now becoming th custom to specify monel metal for valve seats, discs stems, on gate valves, high-pressure globe valves, etc where the temperature is 650 degrees Fahr. or highe and where the pressure is 250 lb. or higher. Monel meta is superior to steel in resisting the erosion and wir cutting of superheated steam. It also resists salt wat and acid water very well. The long list of acids that d not affect monel metal is surprising. In fact it claimed to be more generally resistant to chemical co rosion than any other commercial alloy on the mark today. Although the first cost of monel metal parts usually high, it will doubtless prove to be well wor while in the minimization of shutdowns and r placements. Monel metal is a nickel copper alloy of hig nickel content, and is said to contain only 0.015 per ce of iron. Its tensile strength varies from 80,000 to 15 000 lb. per sq. in., depending on the temperature. Ev at a temperature as high as 1000 degrees F. its streng is as high as 50,000 pounds per square inch.

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WHERE to PURCHASE MODERN EQUIPMENT

for Mill Shop & Factory

BEARINGS

Bearing Metal—A Book containing practical and helpful information on bearing metal selection is offered by The Magnolia Metal Company on page 103.

Roller Bearings—A new trade mark that assures permanent safeguards against friction and wear. Hyatt Roller Bearing Company. See P. (See Colored Advertising Section.)

Ball Bearings—Two valuable treatises on the application of ball bearings to electric motors. They are "Cutting Your Costs" (non-technical) and "Booklet K" (technical). Write to The New Departure Manufacturing Co. See A. (See Colored Advertising Section.)

Oilless Bearings—Bearings that give years of service without wearing and cut manufacturing costs are described by The Arguto Oilless Bearing Company. See page 55.

Bearings—Certified surveys that give full details of savings are to be had from the SKF Industries, Inc. See page 4.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Motors—A new motor book on Linc-Weld Motors is awaiting you at Lincoln Electric Company. Page O. (See Colored Advertising Section.)

Should any motor have a compensator today? For the answer, write The Triumph Electric Company. Page 68.

The latest achievement of The Master Engineers is described by The Master Electric Company. Page 101.

A motor so equipped with ball bearings that the life of it is greatly prolonged. Write for bulletin to Valley Electric Company. Page 28.

—for all industrial purposes. Diehl Mfg. Co. See page 70.

Announcing a complete new line of totally enclosed, fan-cooled motors. General Electric Company. See pages 40-41.

Lights—Where and when needed are described by The American Fixture Company. Page 101.

Portable Electric Lights—Bulletin 501-S, describing all the uses of the Reelite cable is offered by Appleton Electric Company. Page 33.

Electrical Drills—A two-speed electrical drill for smaller sized bits. The Cincinnati Electric Tool Company. Page 37.

Grinders—Thirty years of service to industry in electrically driven drills, grinders and buffers. Page 35. The U. S. Electric Tool Co.

—and equipment are described in a new booklet—also a tap drill chart. Wisconsin Electric Company. Page 71.

MAINTENANCE

Water Tanks—An elevated tank that assures fire protection. Write for booklet. Chicago Bridge & Iron Works. Page C. (See Colored Advertising Section.)

—that give an adequate supply for sprinkler systems. Chicago Bridge & Iron Works. Page C. (See Colored Advertising Section.)

Paint—Fifty reasons for using Eclipse Asbestocote is given on page 93 by The Arco Company.

The Vortex Painting Method is described by The Vortex Manufacturing Company. Page 101.

Concrete floor hardeners and other paint preservatives are shown on page 39 by L. Sonneborn Sons, Inc.

A paint for every industrial requirement. Goheen Corporation. Inside Back Cover.

Guarantee to Remain White Longest. Write for booklet "More Light." U. S. Gutta Percha Paint Company. Page 3.

Fans—A man cooling fan that increases production is described in circulars offered by Robinson Ventilating Company. Page 97.

Shades—Offset wood fabric shades that bring better light and good ventilation. Hough Shade Corporation. Page 37.

Cleaning Material—Industrial Cleaning Materials and Methods are described by The Oakite Products, Inc. Page 67.

Ladders—A safety ladder which eliminates loss of time and speeds up the work. The Dayton Safety Ladder Company. See page 38.

Window Walls—enough to wall a town are featured by Detroit Steel Products Co. Page G. (See Colored Advertising Section.)

Blowers—Blowers and fans that cut production costs. Buffalo Forge Co. Page H. (See Colored Advertising Section.)

Brushes—coarse wire brushes for portable grinding machines for removing rust and scale from iron and steel. The Osborn Mfg. Co. Page K. (See Colored Advertising Section.)

Unit Heaters—A heater that raises the efficiency of the worker. American Blower Co. See M. (See Colored Advertising Section.)

MATERIALS HANDLING

Pneumatic Conveying. The modern system that recovers 99 per cent. of dust and fumes. The Dust Recovering & Conveying Company. Page L. (See Colored Advertising Section.)

Lift Trucks—A four-wheel lift truck with knuckled steering wheels. C. A. Graham. Page

A lift truck that permits a and steering range. The Stuebing-Cow. 49.

A lift truck designed to y shape or size ordinarily found in the modern industrial plan Send for the booklet "Snapshots of Sensible Savings The Lakewood Engineering Company. Page 36.

Electric Trucks—A description of the special motor designe for The Baker-Raulang Co. Electric Truck. See page 4

An elevating platform truck that saves cost. Page 4 The Yale & Towne Mfg. Co.

(*Continued on page* 96)

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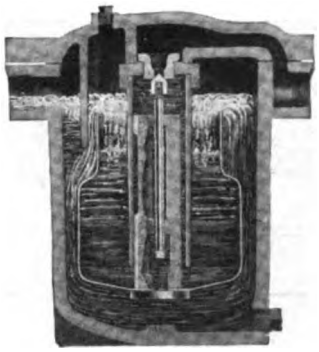
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Signed .....Position .....

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(*Continued from page* 94)

Factory Trucks—A truck that hauls more and lasts longer. Globe Vise & Truck Co. Page 42.

Truck Casters. Economical—Durable—Serviceable. Pioneer Caster & Mfg. Co. See page 91.

Casters—A special duty, all-steel triple ball race truck caster. Bond Foundry Machine Co. See page 47.

Chains—that are the result of more than fifty years of experience. Link-Belt Company. Page 104.

Malleable Buckets—of exceptional hardness and toughness together with proper chains and attachments are described on page 5 by the Jeffrey Mfg. Company.

Car Movers—That move heavily loaded cars are described by The Appleton Car Mover Company. See page 98.

A Car Mover that saves time in moving loaded and empty cars. The Advance Car Mover Company. See page 51.

Wire Rope—of uniform construction that gives maximum protection. Williamsport Wire Rope Company. (See page B (Colored Advertising Section).

Conveyors—For eliminating handling wastes, reducing time between operations, write for "Seven Economies of Logan Conveyors." Logan Company. See page 1.

Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company. See page 46.

Overhead Carriers—An improved tee-bar system is illustrated by Reading Chain & Block Corp. featuring both hand and electric operated. See page J. (See Colored Adv. Section.)

—that move any load from a few pounds to 3 tons—quickly and easily. Richards-Wilcox Mfg. Co. See page 27.

Elevating and Conveying Machinery—that helps to reduce overhead. Page 32. Weller Mfg. Co.

Electric Hoists—an electric hoist for every purpose. Shepard Electric Crane & Hoist Company. See Back Cover

Pushbutton Control Hoists in all capacities for direct and alternating currents. Sprague Electric Hoists Division of Shepard Electric Crane & Hoist Co. Page

With steel plate suspension. Roeper Crane & Hoist Works, Inc. See page 44.

Overhead Hoists—Hand hoists, trolleys and electric pulleys that make up a complete overhead handling system are described on page 53 by Chisholm-Moore Mfg. Co.

Portable Cranes—A Small Portable Crane that is sent on days trial is described in Catalog IN. The Canton Foundry & Machine Company. See page 45.

Pressed Steel Equipment—A complete line of pressed steel material handling equipment is described by The Pow Pressed Steel Company. See page 44.

Trailers—A well-built industrial trailer for industrial purposes. Mercury Mfg. Co. See page 57.

Scales—"Weigh While You Convey," described by The Merrick Scale Mfg. Co. See page 50.

MISCELLANEOUS

Goggles—Welding and Cutting Goggles that eliminate of the injurious rays. Wilson Goggles Company. 65.

Graphite Products—Booklet 61-KP describes a complete of graphite products for all lubricating purposes. Joseph Dixon Crucible Company. Page 66.

Window Cleaners—a trial offer of two gallons of clear fluid is made by the Ever-Glow Company. Page 65

—that clean safely and quickly are described by Gerson Stewart Corp. Page 51.

Counters—A full line of magnetic and mechanical counters for all machines is offered by The Veeder Mfg. Page 91.

(*Continued on page* 98)

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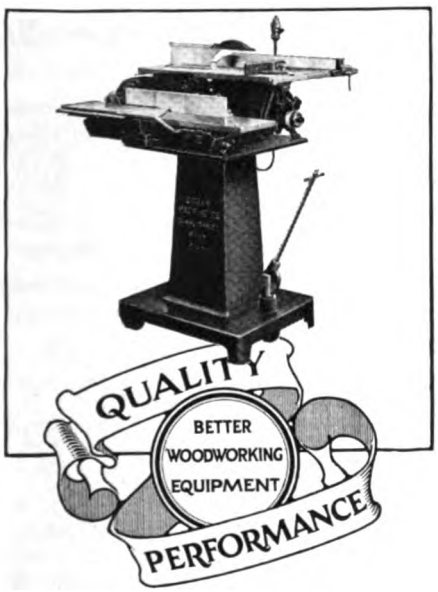
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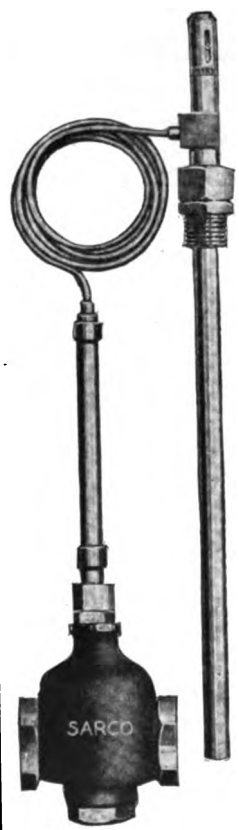
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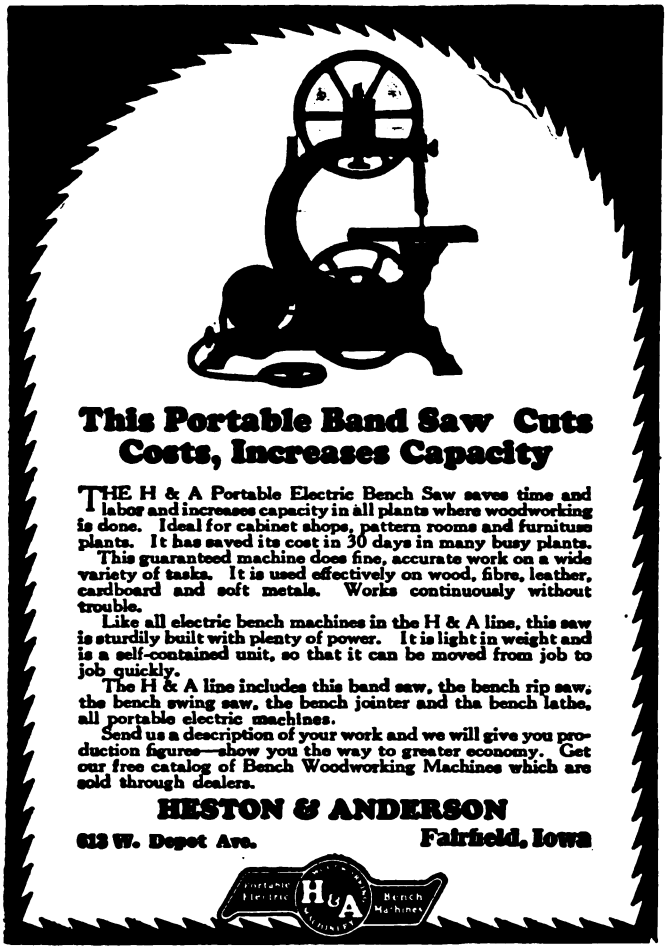
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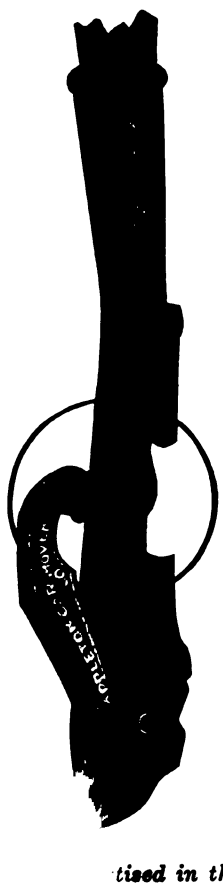
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tised in this issue write Industry Illustrated

(*Continued from page* 96)

Oilers—Oil cups, oil reservoirs and feeders for all purposes. Gits Bros. Mfg. Co. Page 65.

Measuring Instruments—Instruments that carry the guarantee of seventy-odd years of manufacture are described by Taylor Instrument Companies. Page 63.

Pressed Metal Parts—The Breese Bros. Co. Page 37.

POWER PLANT EQUIPMENT AND AUXILIARIES

Steam Traps—Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving maximum heat from steam used. Write for Bulletin 133. Illinois Engineering Company. Page 95.

Eliminating waste in the steam line. A "Sarco" is sent on 30 days free trial. Sarco Co., Inc. Page 97.

Heating Pumps—For the nearest pump engineer, Nash Engineering Company. Page 8.

Unions—A free trial offer is made by E. M. Dart Mfg. Co. Page 60.

Regulators—A feed water regulator that puts boilers on an efficient basis is described in a catalog of The Chaplin-Fulton Mfg. Co. Page 67.

Expansion Joints—that eliminate the destructive action of vibration, expansion and contraction in pipe lines. United States Rubber Company. See page N. (See Colored Advertising Section.)

Industrial Thermometers—A complete service by the Engineering Staff is offered by The Industrial Division of The Moto Meter Company, Inc. Page D. (See Colored Advertising Section.)

TOOLS (Shop Tools, Saws, Files, Chucks, etc.)

Pipe Threading Equipment—The Oster Catalog shows the most complete line of pipe threading equipment in the world. See page 31. The Oster Mfg. Company.

Shop Tools—A buying guide for quality equipment can be obtained from The Brown & Sharpe Mfg. Co. Page 5

Lever Vises—Descriptive circulars of the "Pronto" quick operating and wide opening lever vises may be had from Edw. Purvis & Son. Page 56.

Wrenches—Reversible Ratchet Type are shown by The Lowell Wrench Company. Page 62.

—Of Chrome Vanadium Steel are described by Bonney Forged & Tool Works. Inside Front Cover.

Chrome-Molybdenum Steel Wrenches. J. H. William & Company. Page E. (See Colored Advertising Section.)

Ladles—Bottom pour ladles that save time and metal and assure safety. Rowell Manufacturing Company. Page 67.

Tool Holders—that are being used by over 90% of all the machine shops. Armstrong Bros. Tool Co. Page 56.

Woodworking Machines—of speed, durability and accuracy that lower operating costs are described by Gallmeyer & Livingston Company. Page 97.

Portable Woodworkers—Portable Bench Woodworking machinery. Heston & Anderson. Page 98.

Saws—Cut costs with a Parks shipping room saw. The Parks Woodworking Machine Company. Page 62.

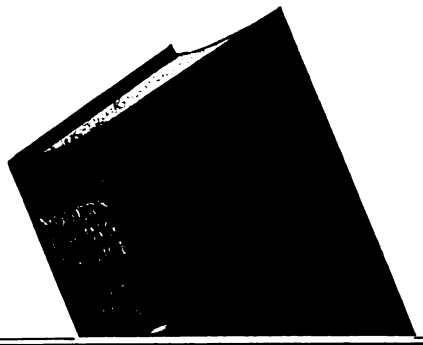
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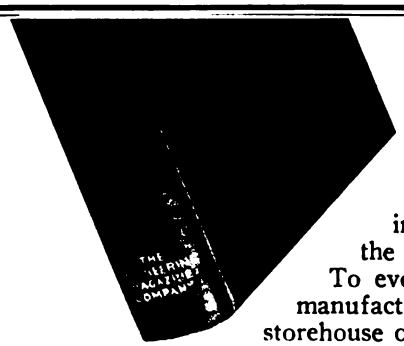
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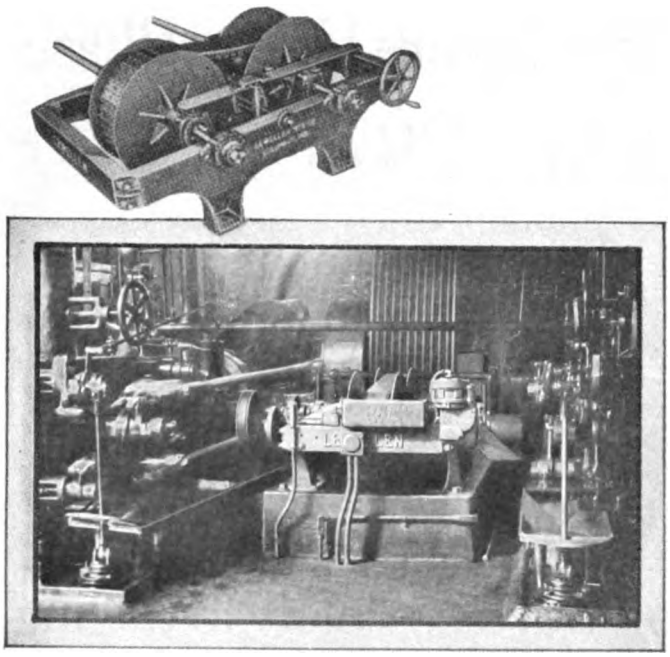
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Hack Saw Blades—with better cutting qualities. America Saw & Mfg. Co. Page 90.

Files—Faster, easier filing. Simonds Saw and Steel Com pany. Page 72.

Filing, Grinding and Polishing Machines—A new develop ment for the finishing of dies and similar work. N. A Strand & Company. Page 70.

Grinders—A portable grinder with a flexible shaft. Ma Tool Company. Page 68.

Surface Grinders—Particularly efficient on a wide variety small tools. Full particulars may be had from the L Salle Tool Company. Page 60.

Drills—The six famous twist drills are described by Th Cleveland Twist Drill Company. Page 61.

For high speed drills see The Standard Tool Co. Pa 51.

Set Screws—a set screw that is guaranteed against breakag The Allen Mfg. Co. Page 64.

TRANSMISSION EQUIPMENT (Including Belting)

Speed Reducers—A catalog describing The Lewellen Tra mission for varying speeds is offered by Lewellen M Company. Page 100.

With Timken tapered roller bearings. Send for the spe reducer bulletin. R. D. Nuttall Company. Page (See Colored Advertising Section.)

A ball bearing force-feed lubricated speed reducer t has an efficiency of over 96%. Reeves Pulley Compa Page 6.

Short Center Drives—A short center belt adjuster is scribed in the Medart Catalog No. 43 among comp list of line shafting equipment. The Medart Compa Page 54.

The Pioneer short center belt drive. Over 8,000 instal F. L. Smidth & Co., Inc. Page 30.

Flexible Shaft Equipment—Cost cutting uses for flex shaft equipment is offered in picture-story form by R Haskins Company. Page 96.

Clutches—that prolong the life and increase the work capacity of any machine. Twin Disc Clutch Comp Page 59.

The New Conway Disc Clutch and its ten salient featu are shown by Conway Clutch Company. Page 52.

Gears—of any diameter or dimension are offered by W. A. Jones Foundry & Machine Company. See 29.

Belting—A transmission belt for short centers and high ley ratios. Alexander Bros., Inc. Page 50.

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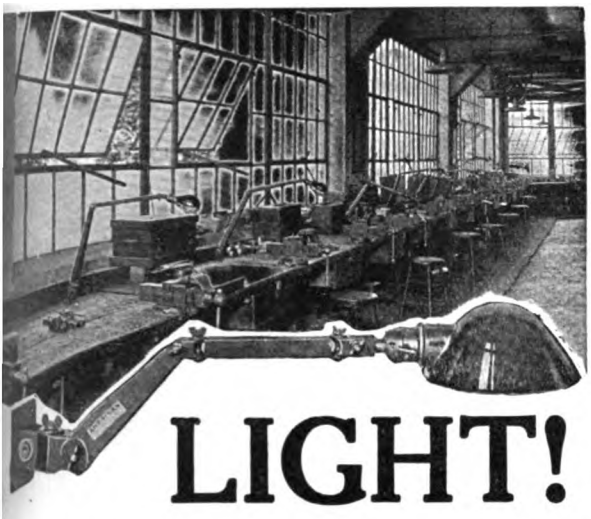
Belt Treatment—that keep the belt as tight as a fiddle-st Cling-Surface Company. Page 66.

A Belt Lacer—combining the dominant features of sp power-ease of operation. Clipper Belt Lacer Comp Page I. (See Colored Advertising Section.)

Pulleys—Pressed steel pulleys and hangers that are li rigid, efficient and adjustable. Write for your co "Worthy Companions." The American Pulley Comp Page 48.

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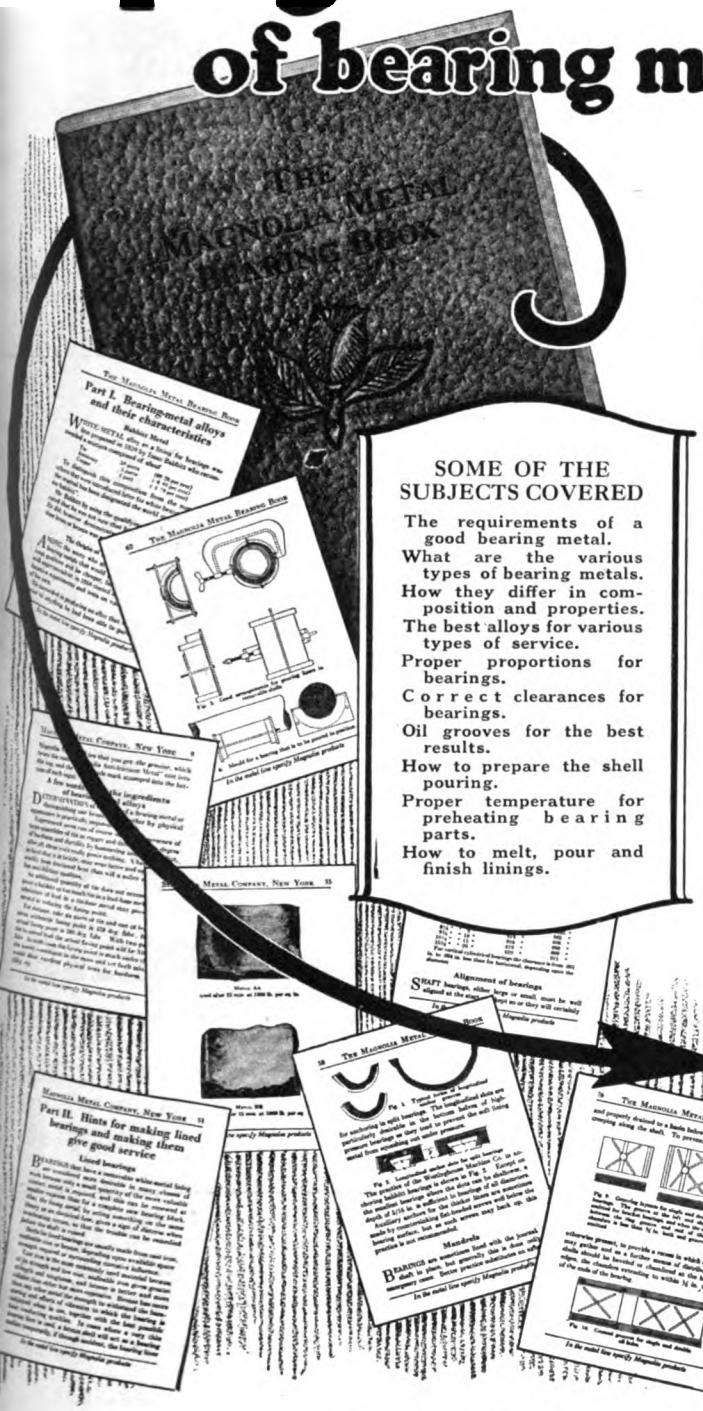
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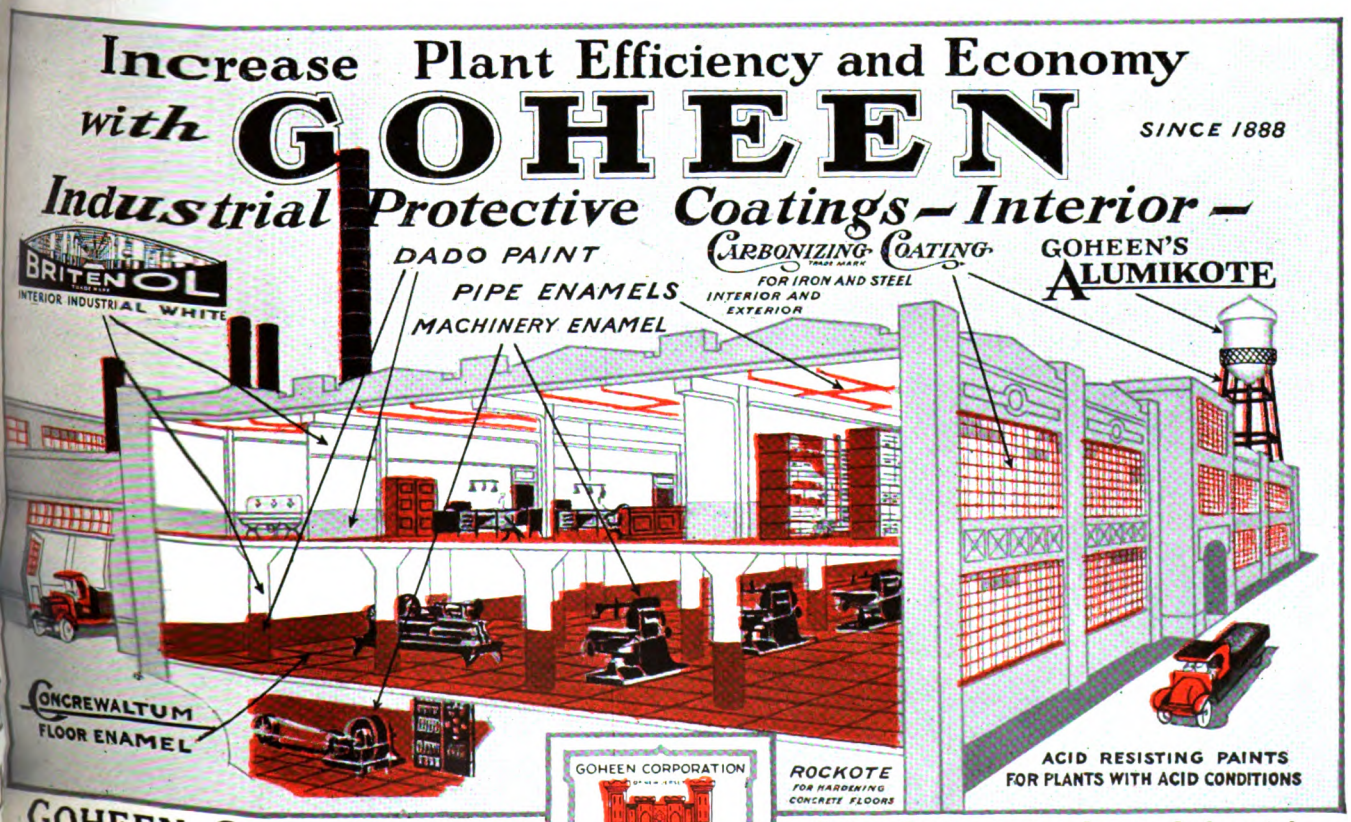
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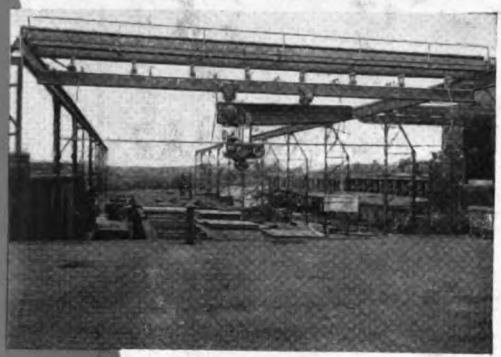
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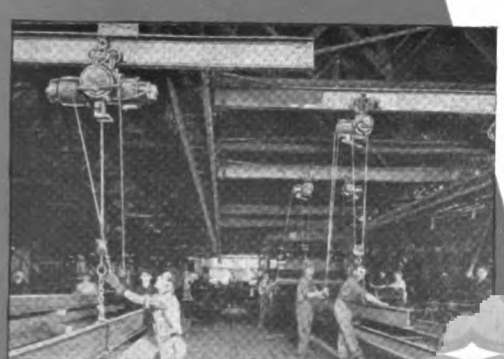
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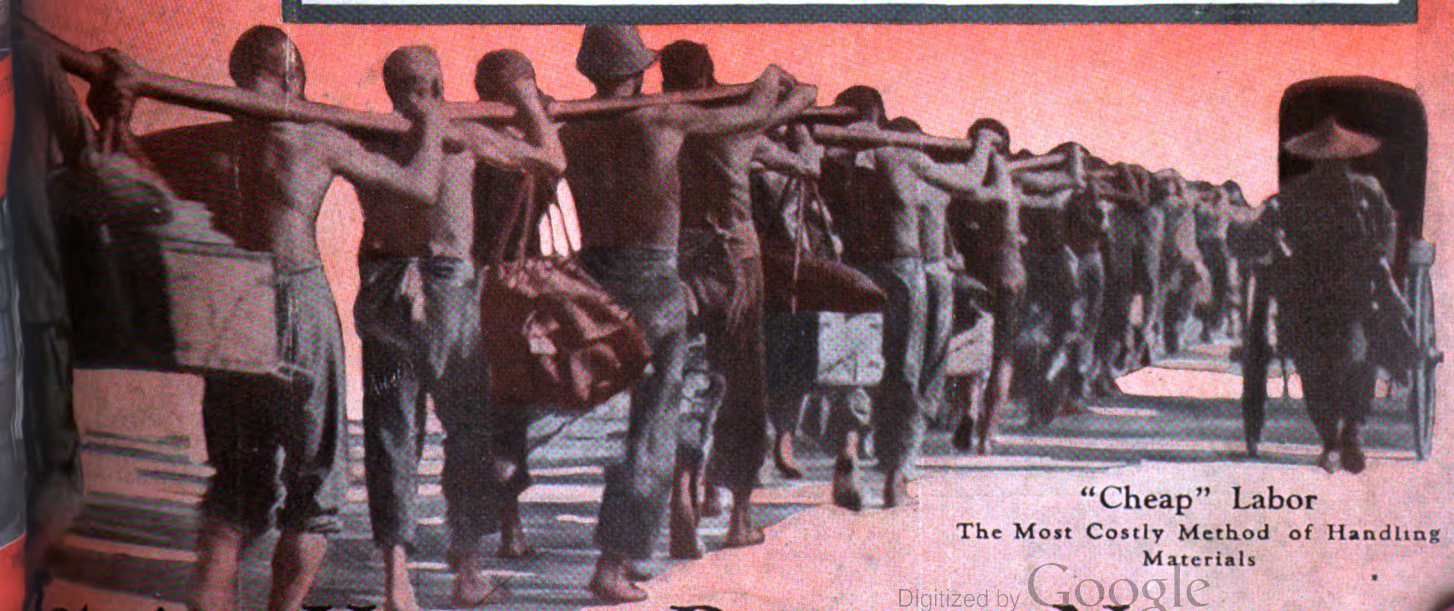
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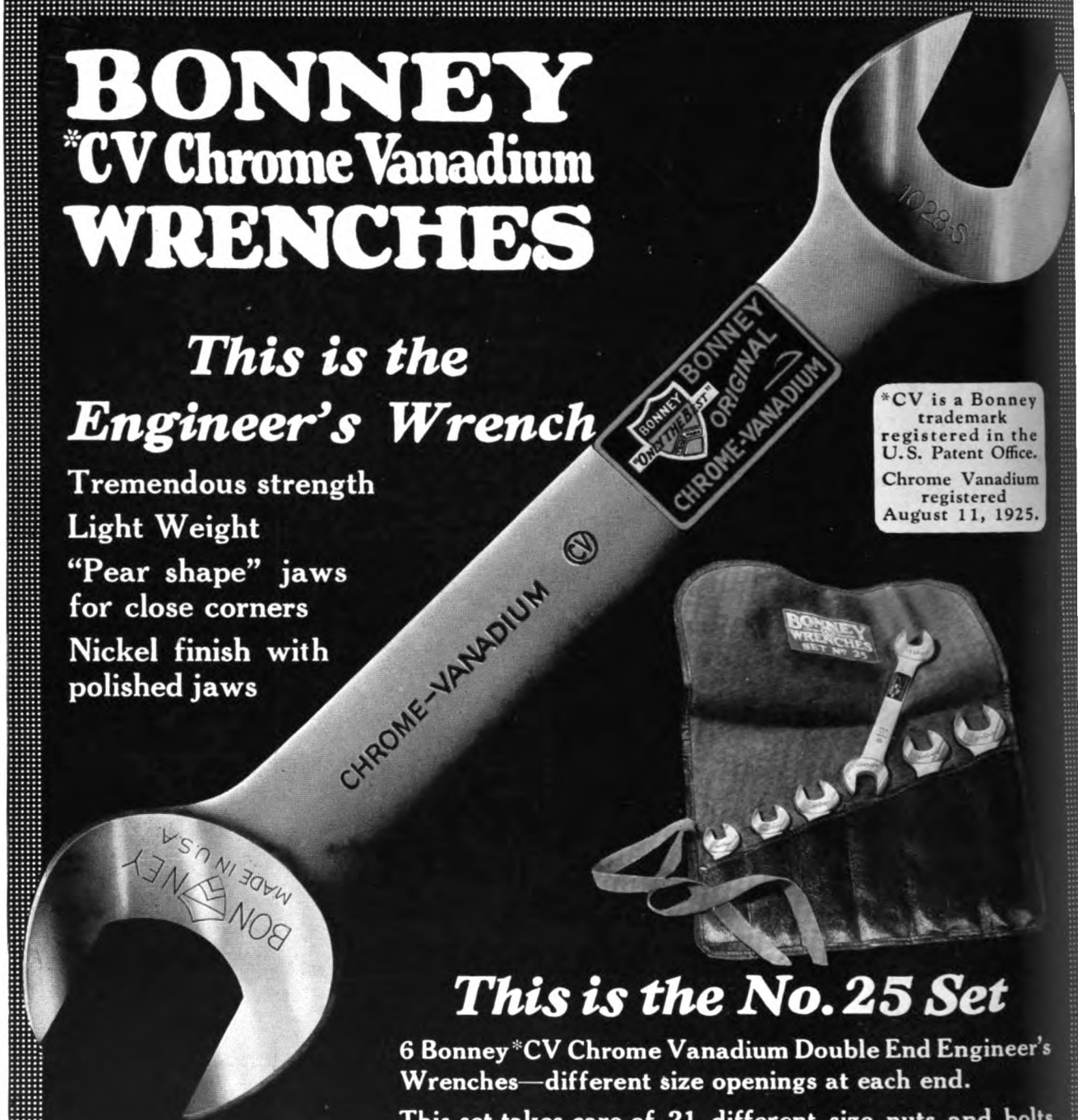


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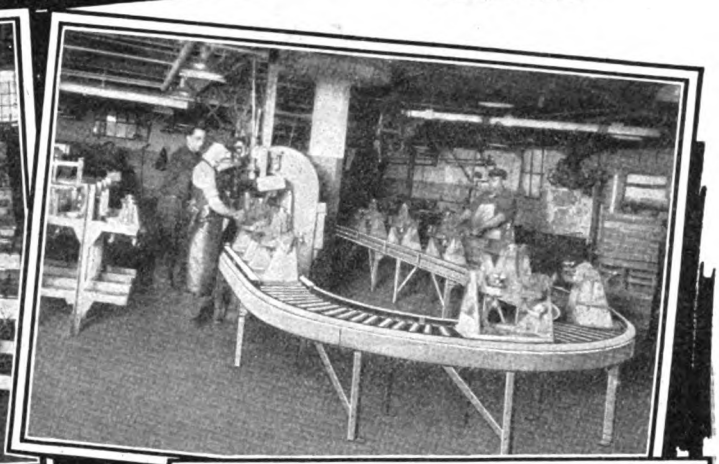
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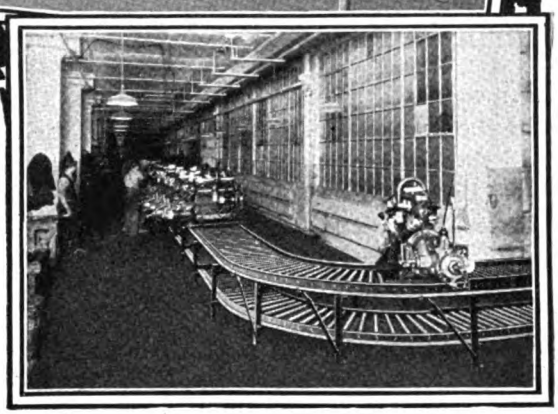
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Overland—another user







Left: Logan Gravity Conveyors enabled the radiator assembly department of Willys-Overland actually to increase production in less floor space. *Upper Right:* This endless line of Logan Gravity Conveyors handles Overland differentials during assembly. *Right:* Motors are assembled on Logan Gravity Conveyors, which carry them to the final chassis assembly.

"SELL yourself an Overland—*just sit at the wheel and drive!*" Upholding such a reputation is more a question of manufacturing than of advertising. Willys-Overland does it by cutting out waste and putting the difference into the car. Logan Conveyors are part of the plan. How much are *you* spending for needless handling? Whatever it is, why not put it into your product or, if you choose, into your pocket? Logan Conveyors can doubtless help materially in either case. Write for a copy of "*Seven Economies of Logan Conveyors*"—yours for the asking.



EXTRAVAGANT claims have no place in the Willys-Overland argument. Proven worth and real economy are the by-words of both Willys-Knight and Whippet . . . Logan Conveyors are sold on the same basis. Installations, for instance, are recommended only where we believe they will be justified. Which is only good business for everyone concerned.

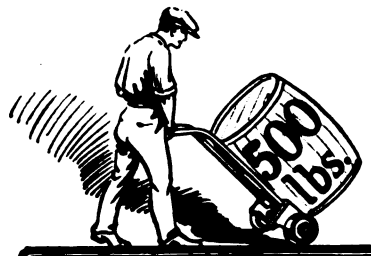
Logan Co.
INCORPORATED 1881
(Formerly THE DOW CO.)

504 N. Buchanan St. LOUISVILLE, KY.

Offices in Principal Cities

Logan Conveyors
LOUISVILLE

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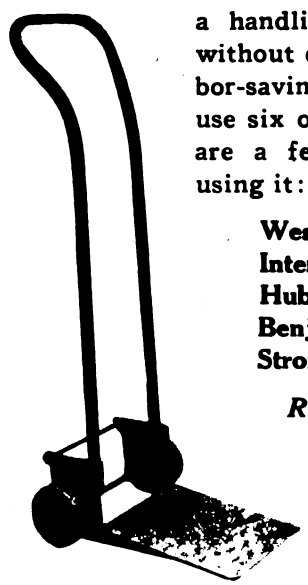


ONE MAN HANDLES 500 lbs.

New simple invention enables one man to do work of two or three.

An age-old principle—"leverage" is the secret of the tremendous lifting power of the Alemite Little Giant Truck. One man can now lift and handle up to 500 lbs. in the form of barrels, boxes, heavy chunks of steel, or other merchandise.

The Alemite Little Giant has found a place in many of America's biggest plants. *It saves man power!* In some instances pays for itself the first week. No concern with a handling problem should be without one or more of these labor-saving trucks. Many plants use six or more. The following are a few prominent concerns using it:



Western Electric Co.
International Harvester Co.
Hubbard Pressed Steel Co.
Benjamin Electric Co.
Strom Ball Bearings Co.

Read this:

The three "Little Giants" are doing the work that formerly required four ordinary trucks and eight men to perform. *Federal Electric Company, Chicago.*

Distributors: Write for proposition.

MAIL COUPON FOR INFORMATION

Alemite Die Casting & Mfg. Co.,
2648 Belmont Ave.,
Chicago, Ill.

Kindly send full information regarding the Alemite Little Giant.

Name .....

Firm .....

Address .....



Materials Handling

IN this issue, we feature among other subjects, that of mechanicalized handling and the important part it plays in production methods.

You will also find that the advertising section this month contains descriptions of many of the machines and equipments used in handling all sorts of products, parts and materials. Here are presented for you the products of the manufacturers who have aided industry toward better, more economical conveying and handling of materials. The "Where to Purchase" Section on Page 142 is a ready guide to these manufacturers and others.

Harvey Conover Jr.
Business Manager.

Industry Illustrated

Published Monthly by
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LUSTROUS ✓ ✓ DURABLE ✓ ✓ WASHABLE ✓

WHITE PAINT



Thousands of industrial plants have found that Barreled Sunlight best combines the qualities they want in interior paint—and at the lowest cost per square foot of surface painted!

GUARANTEED to remain white longer

THE CLAIM of lasting whiteness that we make for Barreled Sunlight is backed by this definite guarantee:

Barreled Sunlight will remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.

Practical proof of this quality over a period of years is one reason why Barreled Sunlight is the most widely used white paint for industrial interiors.

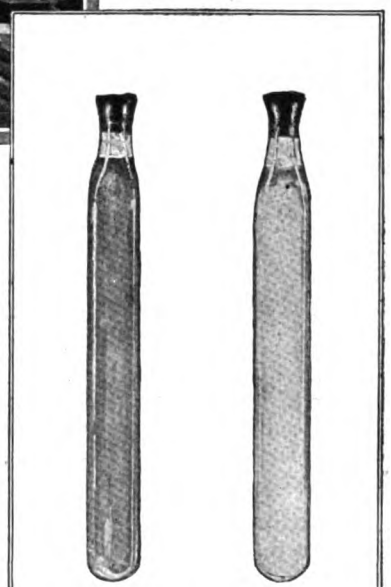
Another reason is *durable cleanliness.* The surface of Barreled Sunlight is so smooth it can't hold dirt embedded, and washes like tile. Repeated washing does not wear it away.

And because this lustrous paint reflects light of just the right quality, it greatly improves working conditions.

With all these advantages, Barreled Sunlight *costs less per square foot of surface covered.* Extremely opaque, it covers a larger area with a given quantity of paint; and containing no varnish, it flows so easily with brush or spray that there is a saving in labor hours.

Sold in 55- and 30-gallon churn-equipped steel drums, and in cans. Where more than one coat is required, use Barreled Sunlight Undercoat first. See coupon.

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.
New York—Chicago—San Francisco
Distributors in all principal cities



THE VIAL at left above contains refined linseed oil as commonly used in white oil paints. It is deep amber color. At right is the same oil after being treated by the "Rice Process." It is almost colorless. This is one of the secrets of the lasting whiteness of Barreled Sunlight. *These are actual photographs.*



THE RICE PROCESS WHITE

Now we offer Outside Barreled Sunlight, and recommend it with the same assurance as we recommend Interior Barreled Sunlight. Write for information as applied to your own outside painting.

Barreled Sunlight
Reg. U. S. Pat. Off.

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

Please send us your booklet on Barreled Sunlight for industrial painting; also painted panel.

Name.....

Street.....

City.....State.....

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OSBORN



A Longer Wearing Bass Broom

This Osborn fibre broom is light, easy to handle and virtually indestructible.

The one-piece seamless steel cap is shrunk around the fibre under tremendous pressure. It is nailed to further clinch the fibre and, as an added protection against loosening, is filled with a special cement.

The handle is held by the close-fitting collar of the steel cap and is securely fastened with two heavy rivets.

Longer wear—greater toughness—and the ability to sweep easily and thoroughly—are outstanding features of this broom. Let us quote you.

Three Grades

The *Coarse* broom is particularly designed for railroad track and heavy-duty sweeping. It can be supplied with a chisel handle and one wire band.

The *Medium* grade is perfect for general factory and warehouse sweeping.

The *Fine* grade is ideal for lighter work—it is more flexible and sweeps clean.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Avenue Cleveland, Ohio

Branch Offices:
New York Detroit Chicago San Francisco Los Angeles

Osborn Brushes



MAKERS OF [illegible]LITY BRUSHES SINCE 1892

For [illegible] *tised in this issue write Industry Illustrated*

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The third decade of elevated tank service



Built in 1908 and still serving the J. I. Case Plow Works, Inc., Racine, Wis.



Built in 1904 and still serving the Nicholson File Company, Providence, R.I.



Built in 1907 and still serving the Packard Motor Car Company, Detroit, Mich.

SCORES of Horton elevated steel tanks are on their third decade of service. Some have completed it, some have just started.

It is not so unusual to find a tank still in existence after 20 years, but the important thing about these Horton Tanks is the way in which they serve during the third decade. Experience has shown that they not only live, but they serve—that even in these years very little maintenance is required. Every tank shown in the illustrations is reported "Entirely Satisfactory" by the owner.

This long life coupled with low maintenance cost is what pulls down the annual charge on Horton Tanks to such low levels. When you install a tank for fire protection or general service, consider this quality of Horton Tanks. They are moderate in first cost but they are often much more economical than a cheaper tank. Ask our nearest office for quotations.

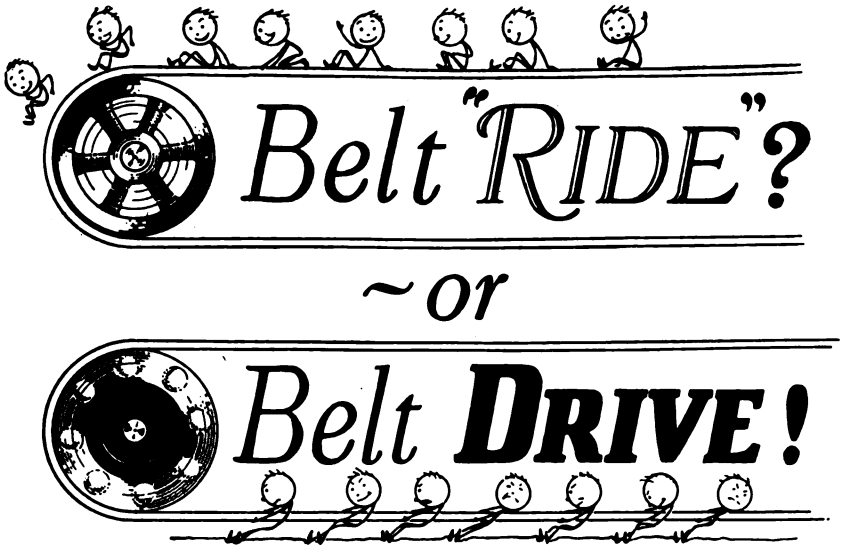
CHICAGO BRIDGE & IRON WORKS

Chicago: 2465 Old Colony Bldg.
New York: 3169 Hudson Terminal Bldg.
Cleveland: 2238 Union Trust Bldg.
Dallas: 1658 Dallas National Bank Bldg.
Atlanta: 1023 Healey Bldg.
San Francisco: 1043 Rialto Bldg.

HORTON TANKS

I18-Gray

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Rigging up a belt between two pulleys does not give you a belt **DRIVE.** Unless *both* pulleys really PULL, you have belt "Ride"—a wasteful condition.

Often the driving pulley puts power *into* a belt but the receiving pulley is unable to take the power *out*. The belt slips and slides along the face of the second pulley and only a small portion of the power gets to the driven machine.

Eliminate belt "Ride." Use ROCKWOOD PULLEYS and make a real belt **DRIVE.** These superior PULLEYS, with their end-grain fibres having a natural ability for PULLing a belt, give a surprising increase in power . . . smooth, steady and dependable.

There isn't a belt-driven machine built that cannot be benefited in some way by the use of ROCKWOOD PULLEYS. Put them to the test!

[***We are always ready*** to assist manufacturers—and users—of belt-driven machinery to get maximum results with properly designed belt drives.]

THE ROCKWOOD MANUFACTURING CO.
INDIANAPOLIS, INDIANA, U. S. A.



Complete Service Stocks from Coast to Coast!

For prompt deliveries we maintain a national distribution of stocks as listed below. Daily factory shipments keep these stocks complete.

***ALBANY, N. Y.**—909 Sizes 1½ to 8 in. dia.
Sager-Spuck Supply Co., 364 Broadway.
ATLANTA, GA.—1734 Sizes 1½ to 12 in. dia.
Fulton Supply Co., 70 Nelson St.
***BALTIMORE, MD.**—1297 Sizes 1½ to 10 in. dia.
Carey Machinery & Sup. Co., 119 E. Lombard St.
BIRMINGHAM, ALA.—909 Sizes 1½ to 8 in. dia.
Matthews Electric Supply Co.
BOSTON, MASS.—2194 Sizes 1½ to 14 in. dia.
Olmsted-Flint Corp., Cambridge.
***BUFFALO, N. Y.**—1297 Sizes 1½ to 10 in. dia.
Root, Neal & Co., 178 Main St.
***CHARLOTTE, N. C.**—909 Sizes 1½ to 8 in. dia.
The Charlotte Supply Co., 500 Mint St.
***CHATTANOOGA, TENN.**—909 Sizes 1½ to 8 in. dia.
The James Supply Co., 1104 Market St.
CHICAGO, ILL.—2194 Sizes 1½ to 14 in. dia.
Chicago Electric Co., 740 W. Van Buren St.
CINCINNATI, OHIO—1297 Sizes 1½ to 10 in. dia.
Doermann-Roehrer Co., 450 E. Pearl St.
CLEVELAND, OHIO—2194 Sizes 1½ to 14 in. dia.
Strong, Carlisle & Hammond, 1394 W. Third St.
DALLAS, TEXAS—2194 Sizes 1½ to 14 in. dia.
Southwest General Elec. Co., 1801 N. Lamar St.
***DAYTON, OHIO**—909 Sizes 1½ to 8 in. dia.
Patterson Tool & Sup. Co., 125 E. Third St.
***DENVER, COLO.**—909 Sizes 1½ to 8 in. dia.
Hendrie & Bolthoff Mfg. & Sup. Co., 1635 17th St.
***DES MOINES, IOWA**—909 Sizes 1½ to 8 in. dia.
Iowa Machy. & Sup. Co., 315 W. Court Ave.
DETROIT, MICH.—2194 Sizes 1½ to 14 in. dia.
Spaulding Electric Co., 1344 Michigan Ave.
***GRAND RAPIDS, MICH.**—909 Sizes 1½ to 8 in. dia.
F. Raniville Co., 241 Pearl St., N. W.
INDIANAPOLIS—2194 Sizes 1½ to 14 in. dia.
Rockwood Paper Pulley Stores, Inc., 1801 English.
***JACKSONVILLE, FLA.**—909 Sizes 1½ to 8 in. dia.
Cameron & Barkley Co., 665 E. Forsyth St.
***KANSAS CITY, MO.**—1297 Sizes 1½ to 10 in. dia.
Webb Belting Co., 1501 West Twelfth St.
LOS ANGELES—2268 Sizes 1½ to 24 in. dia.
Illinois Electric Co., 313 S. San Pedro St.
LOUISVILLE, KY.—909 Sizes 1½ to 8 in. dia.
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***MEMPHIS, TENN.**—909 Sizes 1½ to 8 in. dia.
The Riechman-Crosby Co., 223 S. Front St.
MILWAUKEE, WIS.—1297 Sizes 1½ to 10 in. dia.
Julius Andrae & Sons Co., Broadway and Mich.
***NASHVILLE, TENN.**—909 Sizes 1½ to 8 in. dia.
Nashville Machine & Sup. Co., 123 3rd Ave. N.
***NEW ORLEANS**—909 Sizes 1½ to 8 in. dia.
Woodward, Wight & Company.
NEW YORK CITY—2194 Sizes 1½ to 14 in. dia.
Rockwood Paper Pulley Stores, Inc., 6 Murray St.
OMAHA, NEB.—909 Sizes 1½ to 8 in. dia.
Interstate Machy. & Sup. Co., 1006 Douglas St.
***OKLAHOMA CITY**—909 Sizes 1½ to 8 in. dia.
A. W. White, 424 West Reno St.
PHILADELPHIA, PA.—2194 Sizes 1½ to 14 in. dia.
Charles Bond Company, 617 Arch St.
***PITTSBURGH, PA.**—1734 Sizes 1½ to 12 in. dia.
Transmission & Belting Co., 325 Second Ave.
ROCHESTER, N. Y.—909 Sizes 1½ to 8 in. dia.
Rochester Electrical Sup. Co., 240 St. Paul St.
SALT LAKE CITY—909 Sizes 1½ to 8 in. dia.
Capital Electric Co., 310 W. Second South St.
SAN FRANCISCO—2248 Sizes 1½ to 20 in. dia.
Buzzell Electric Works, 130 8th St.
SEATTLE, WASH.—2194 Sizes 1½ to 14 in. dia.
Seattle Hardware Co., 501 First Ave., South.
ST. LOUIS, MO.—2194 Sizes 1½ to 14 in. dia.
Teuscher Pulley & Belting Co., 801 N. 2nd St.
ST. PAUL, MINN.—1297 Sizes 1½ to 10 in. dia.
St. Paul Electric Co., 145 E. Fifth St.
SYRACUSE, N. Y.—909 Sizes 1½ to 8 in. dia.
Syracuse Supply Co., 314 W. Fayette St.
TOLEDO, OHIO—909 Sizes 1½ to 8 in. dia.
W. G. Nagel Supply Div., 28 St. Clair St.

CANADA

***MONTREAL, QUEBEC**—909 Sizes 1½ to 8 in. dia.
Williams & Wilson, Ltd., 84 Inspector St.
***TORONTO, ONTARIO**—1297 Sizes 1½ to 10 in. dia.
Bond Engineering Works, Ltd., Foot of Cherry St.

★ *In addition to COMPLETE range of sizes listed, also carry some larger sizes.*

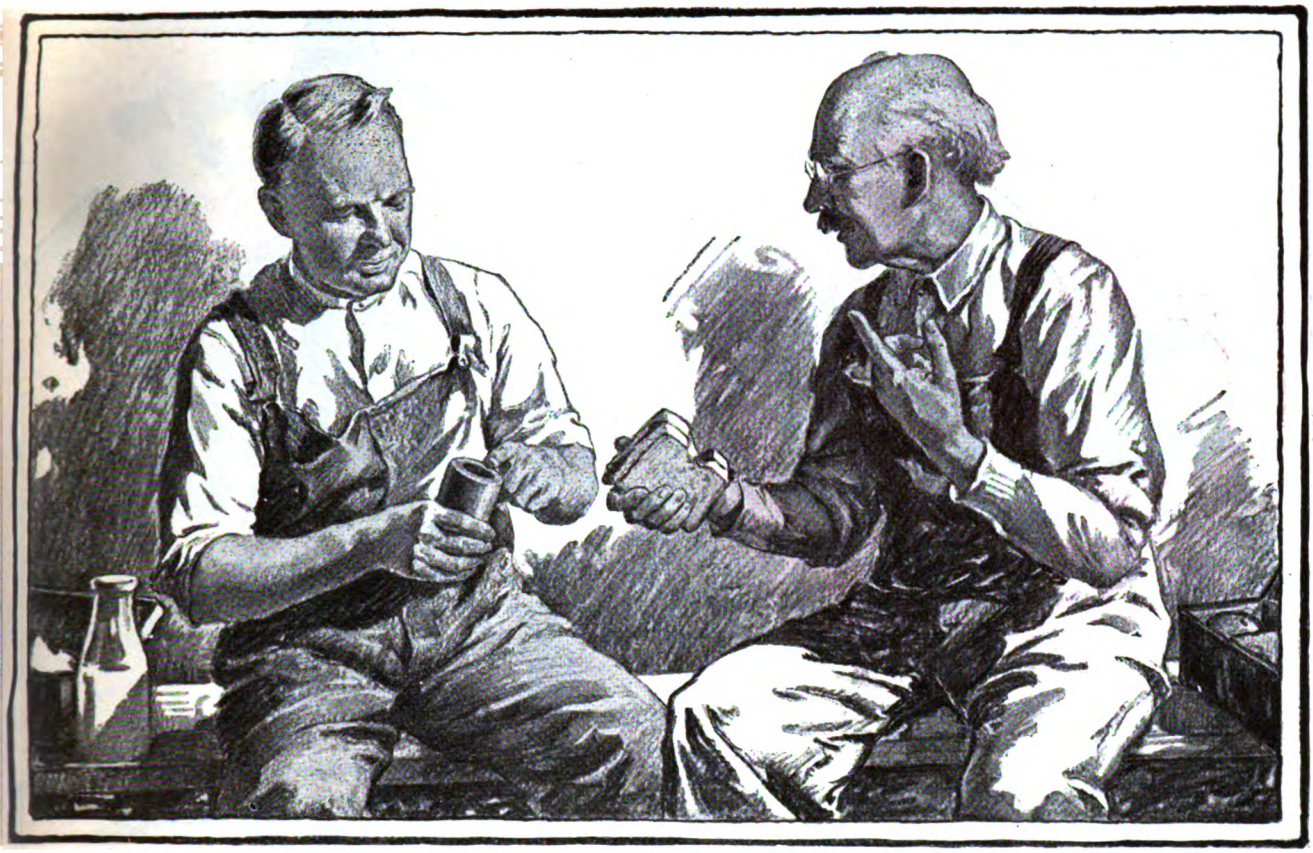


2194 stock sizes Rockwood Pulleys, 1½" to 14" diameters, are available for immediate delivery. Other sizes to 72" diam. can be promptly made to order.

ROCKWOOD
PULLEYS - PULL

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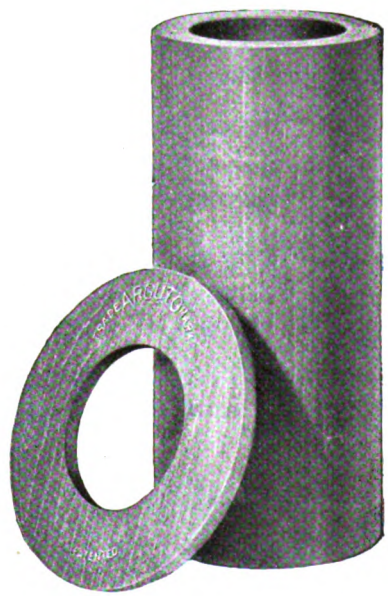


"It was 1902, I tell ye!" "You're off, I put that Arguto up myself in 1901!"

ONE of the old boys is wrong, but what's the difference? If the only argument you ever get out of a bearing is whether it lasted 23 years or 24 years, there's no cause for complaint.

The fact that Argutos never fail to deliver a generation of uninterrupted service *without a drop of oil or a minute's attention* is the main issue—and one that will pay you to look into. They eliminate danger of fire from overheated bearings, the spattering of oil over expensive materials, the danger of oiling while in motion and the expense of shutdowns for bearing replacement. Their price is about one-tenth that of bronze, yet they have a bearing surface that requires no oil or grease in a life time.

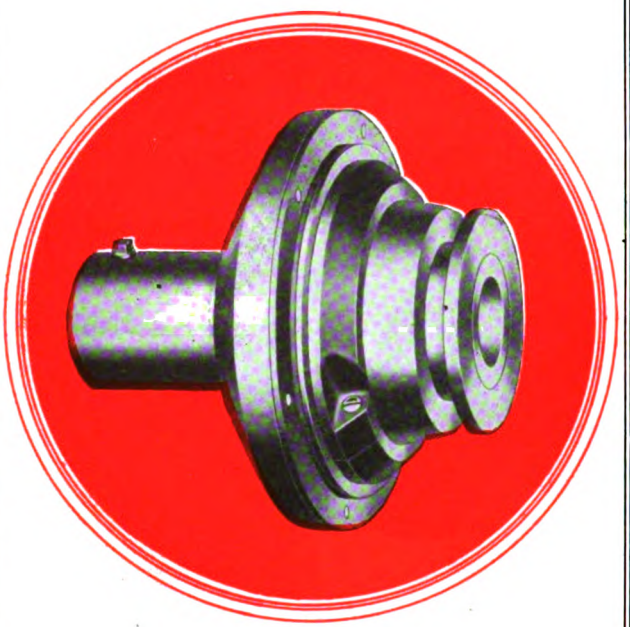
Write us if you make, operate or sell loose pulleys and light shafting.



ARGUTO OILLESS BEARING CO.
Wayne Junction—Philadelphia, Pa.

Arguto OILLESS BEARINGS

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The Conway Disc Clutch is the last word in friction clutches:

Entirely enclosed,
Inherently balanced,
With under-slung levers,
Large lever ratio,
Accessible, accurate adjustment,
Drag free idling,
Helped instead of hindered by centrifugal force,
Steel Discs,
Chrome-nickel forged levers,
Full length bearing for loose member.

It's the first progressive departure in the design of Disc Clutches in many years. Investigate Conway Clutches.

THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio



BE SURE ITS A Moly
H-K-Wood's
Mo-lyb-den-um
The American Super Steel
Shovels
THE WOOD SHOVEL AND TOOL CO. PIQUA, OHIO, U.S.A.

EIGHTY miles of granite spalls represent quite an e cursion for a shovel blade. How much farther t H. K. Wood's Mo-*lyb*-den-um Steel Shovel blade wou have gone, without giving a trace of inclination to fractu seemed an unnecessary part of a trip on which the oth makes of shovels that started out broke up under the str of one-fifth of the distance.

Incidentally the Moly lifted about 3500 tons of fearfu hard granite spalls but gave no real evidence of havi been put to a test.

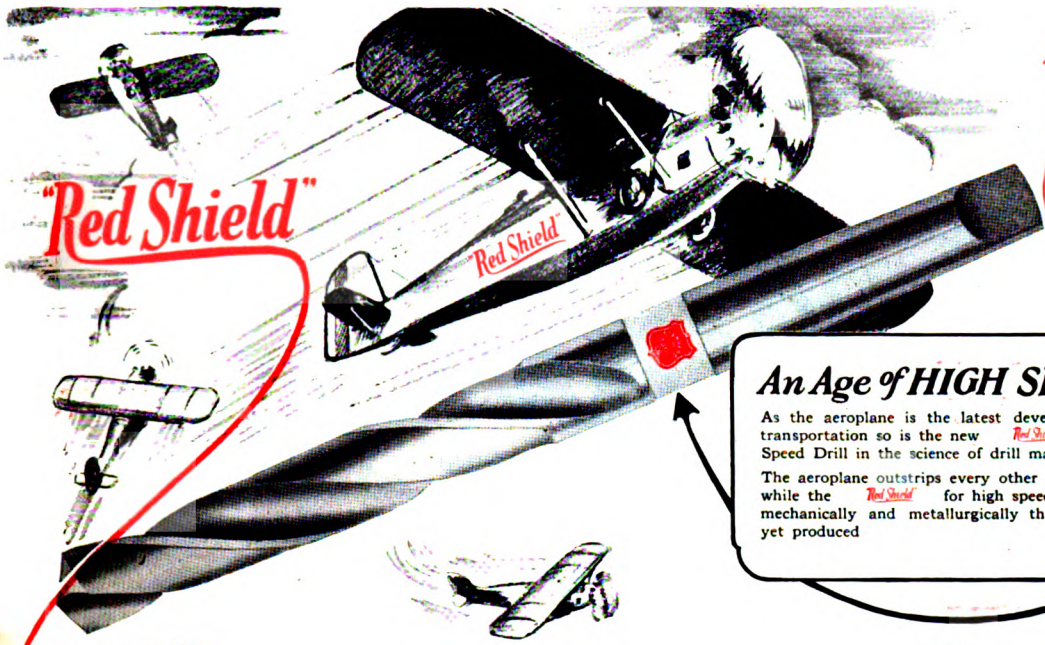
Picked at random from a pile of blades in the factory, t blade is no different than any other H. H. Wood's Mo-l den-um Steel Shovel blade. They are all alike, and it's persistence with which they are alike that establishes th shovels on any and every kind of a job as being durable a preferable beyond comparison.

Where shoveling cost and shovel consumption are watc the Moly shows up as consistently and persistently economi Lighter weight for equal capacity and strength means an crease in the quantity of material handled with less eff The extraordinary durability, because of the hardest toughest blade made, reduces the expense for shovels.

In every-day use, like on the 80-mile excursion, the M goes five times as far and is then just about ready to out-w half a dozen more shovels.

THE WOOD SHOVEL & TOOL C
Piqua, Ohio, U. S. A.

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STANDARD TOOL CO.

An Age of HIGH SPEED

As the aeroplane is the latest development in transportation so is the new Red Shield High Speed Drill in the science of drill making.

The aeroplane outstrips every other conveyance, while the Red Shield for high speed drilling is mechanically and metallurgically the best drill yet produced

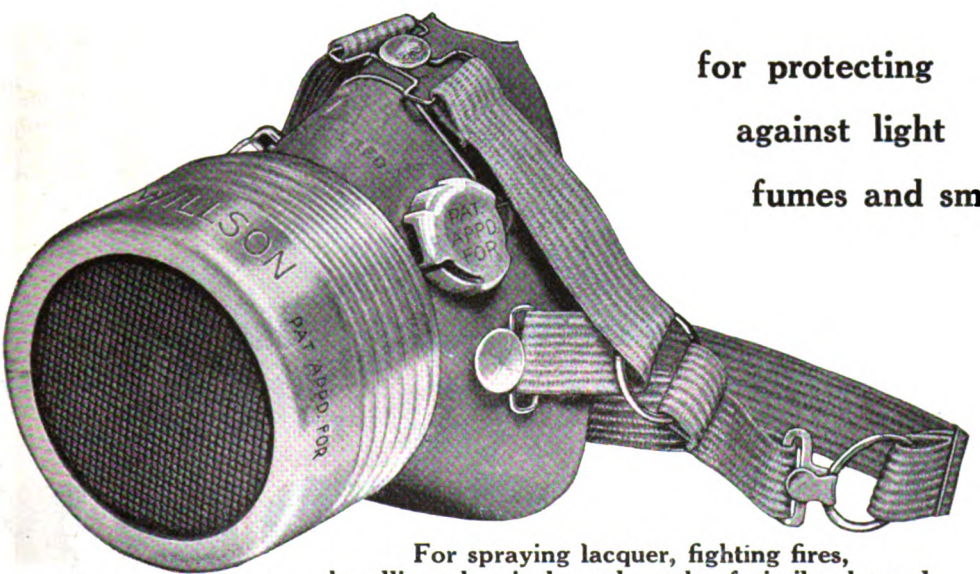
HIGH SPEED DRILLS

ALL SIZES
Write for Catalog

THE STANDARD TOOL CO.

CLEVELAND
New York: 94 Reade St. Chicago: 552 W. Washington Blvd.
Fredk. Pollard & Co., Ltd., London and Leicester, England Paris, France—Burton Fils

The Willson Fume and Smoke Mask



for protecting against light fumes and smoke.

For spraying lacquer, fighting fires, handling chemicals and work of similar hazard.

Price, Willson Fume and Smoke Mask Complete and two extra chemical cartridges in a metal case, $72.00 per dozen f.o.b. any Willson Distributing Depot, or

WILLSON GOGGLES, INC., READING, PA.

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Speed + Power

Worcester Polytechnic Institute
Worcester, Massachusetts

DEPARTMENT OF MECHANICAL ENGINEERING

November 30, 1926

Clipper Belt Lacer Company
Grand Rapids
Michigan

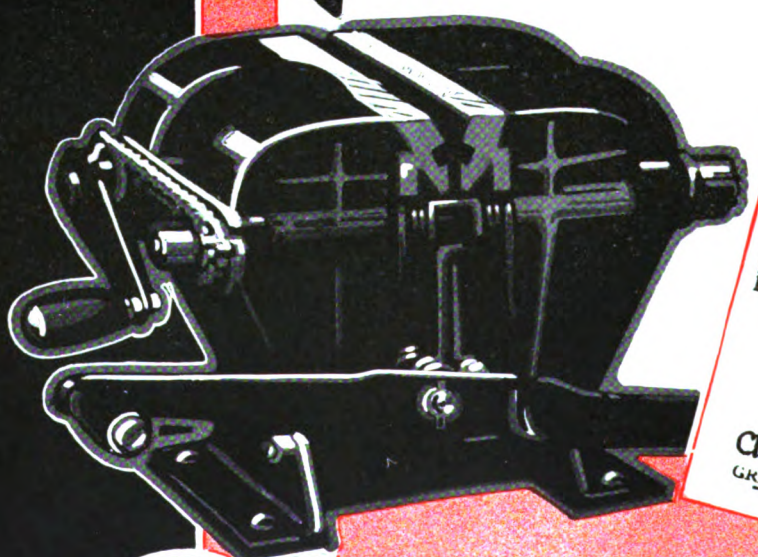
Gentlemen:

A #8 Clipper Belt Lacer of new design tested in our laboratories at Worcester Polytechnic Institute showed that a normal man could exert a jaw pressure of 45,900 lbs. when operating the device with the standard double ended crank.

Yours very truly,

Francis W. Roys

Francis W. Roys
Head of the Dept.
Of Mech. Eng.



45,900 pounds pressure, the weight of six bull elephants, embeds Clipper Belt Hooks absolutely flush with the belt surface.

The New Clipper No. 8 SPEED Lacer laces both ends of any belt up to 8 inches in width in 1½ minutes. One man operates it easily. These three dominant features—POWER, SPEED, EASE OF OPERATION—place the new Clipper No. 8 SPEED Lacer in a class by itself.

Clipper products satisfy any belt lacing requirement.

QUALITY BELT LACING

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

Clipper

No 8 Speed Lacer

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They're all turning to "VULCAN" tongs





GENUINE WILLIAMS' "VULCAN" Pipe Tongs are standard equipment in most plumbing and pipe-fitting shops from coast to coast. Their instant, slipless grip combined with ready release, has won them unprecedented popularity.

See the Improved "Vulcan." Try it on a piece of pipe. Notice the double-ended, reversible jaws which practically double the life of the tool. Examine the proof-tested, CERTIFIED chain. It guarantees safety to the operator. Get the "feel" of a "Vulcan" in your hands. You'll want to add one to your tools right off.

Nine sizes for ⅛ to 18-inch pipe.

J. H. WILLIAMS & CO.

"The Wrench People"

New York - BUFFALO - Chicago

See OUR EXHIBIT NATIONAL STEEL & MACHINE TOOL EXPOSITION DETROIT CONVENTION HALL Sept. 19-23 BOOTH 366

See our Exhibit
National Machine
ol Builders' Exposition
Cleveland Auditorium
Sept. 19-23
Booth 10



WILLIAMS

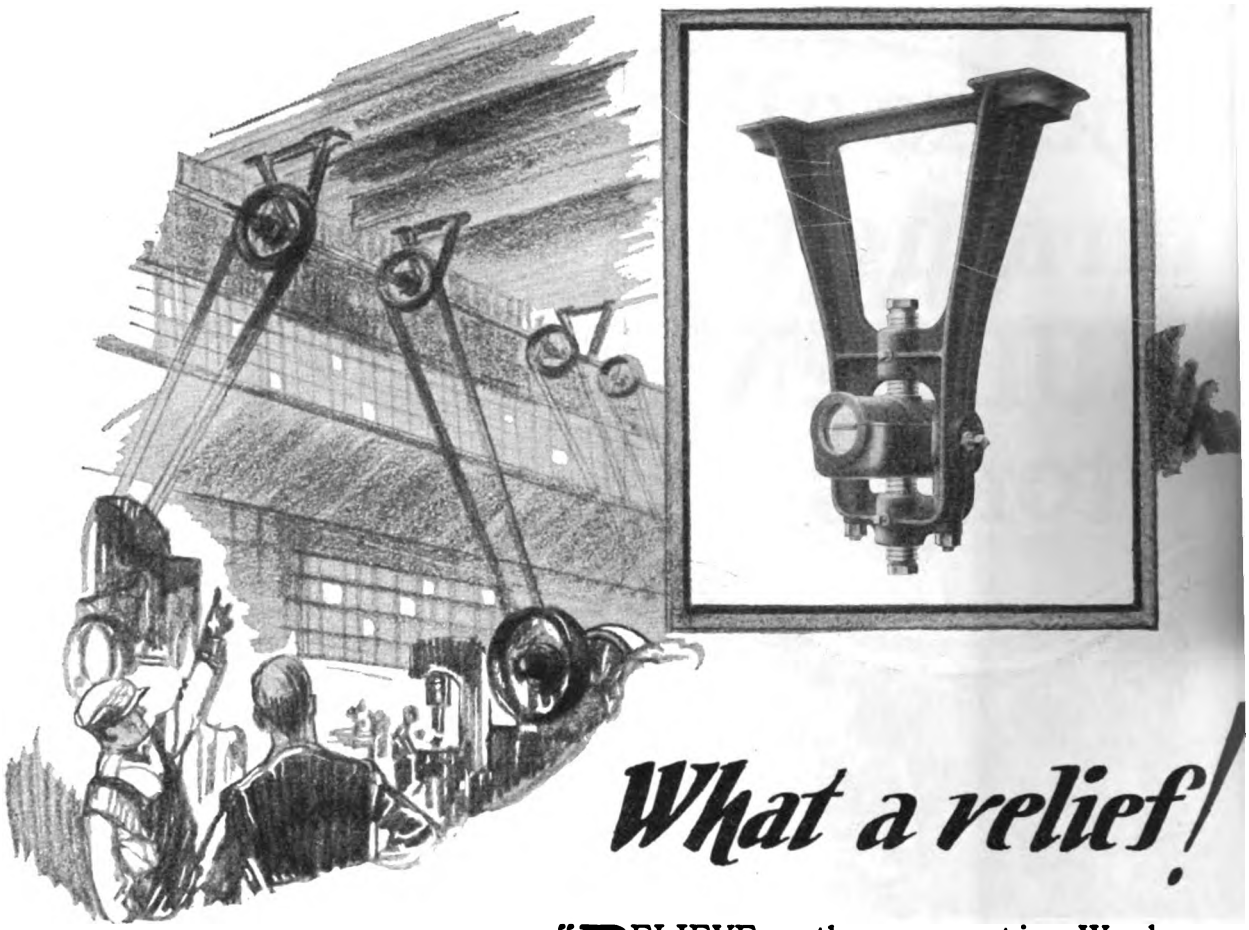
SUPERIOR DROP-FORGED TOOLS

"VULCAN"

IMPROVED CHAIN PIPE TONGS

75-P-2

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What a relief!

"BELIEVE me those new cast iron Wood Hangers we put up last year are there for keeps. We haven't had to touch 'em since—and they are as solid and true to line as the day we installed 'em."

And no wonder you can put Wood's Cast Iron Hangers up and forget 'em. Their cast iron construction and special reinforced design gives a rigidity that can't be beat.

Then notice that ball and socket adjustment feature. That's a real job. A simple turn of a wrench assures perfect alignment of the shafting and cuts down friction to the minimum.

And to cap the climax, there's that ring oiling feature that provides positive lubrication to the bearings automatically.

There's no use talking those Wood's Cast Iron Hangers are masterpieces.

SEVENTY YEARS of SERVICE 1857 1927 T.B. WOOD'S SONS CO. POWER TRANSMISSION MACHINERY CHAMBERSBURG, PA.

Wood's Power Transmission Machinery

Shafting	Pulleys
Hangers	Pillow Blocks
Couplings	Belt Contactors
Rope Drives	Speed Reducers
Friction Clutches	Conveyors

Ball Bearings

Write for Descriptive Catalog

T. B. WOOD'S SONS CO.
CHAMBERSBURG, PENNA.

WOOD'S CAST IRON HANGER

F *ertised in this issue write Industry Illustrated*

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Just What Does a Damaged Shipment Cost?

The replacement price of the damaged merchandise you say. But is that all?











He Knows Packages

Expert Package Engineers—40 of them—laboratory schooled and factory trained will give you the benefit of H & D's 23 years of studying, designing and building boxes—will design for you a package to fit the particular needs of your product, to carry your product with more safety and at minimum cost. A visit from one of them involves no obligation on your part. Write today for our book "How to Use H & D Free Service." It tells the whole story.







HOW about the cost of the correspondence that the adjustment requires? The time your employees have to spend in checking that particular shipment to ascertain the cause of damage? The bookkeeper's time in entering credits and debits to balance the account? The shipping charges on the returned merchandise and the shipping charges on the new merchandise sent in replacement? And more important, the effect of the delay on your customer—particularly if the shipment was wanted in a hurry?

Small items, maybe, all of them. But in the aggregate they mean real money losses—in needless clerical salaries, in cost of damaged merchandise, in customer's good will and possibly in customer's business, for delays and trouble may lose a good account.

Thousands of shippers are eliminating these needless profit-reducing expenses—are standardizing on H & D Corrugated Fibre Shipping boxes, because they have learned the real cost of damaged shipments. You, too, can increase your profits by using them.

THE HINDE & DAUCH PAPER CO.
299 Decatur Street · Sandusky, Ohio

H&D HINDE & DAUCH CORRUGATED FIBRE SHIPPING BOXES



THE HINDE & DAUCH PAPER CO., 299 Decatur Street Sandusky, Ohio

Please have a Package Engineer call ☐

Send me copy of booklet, *"How to Use H & D Free Service."* ☐

Name of Company _____

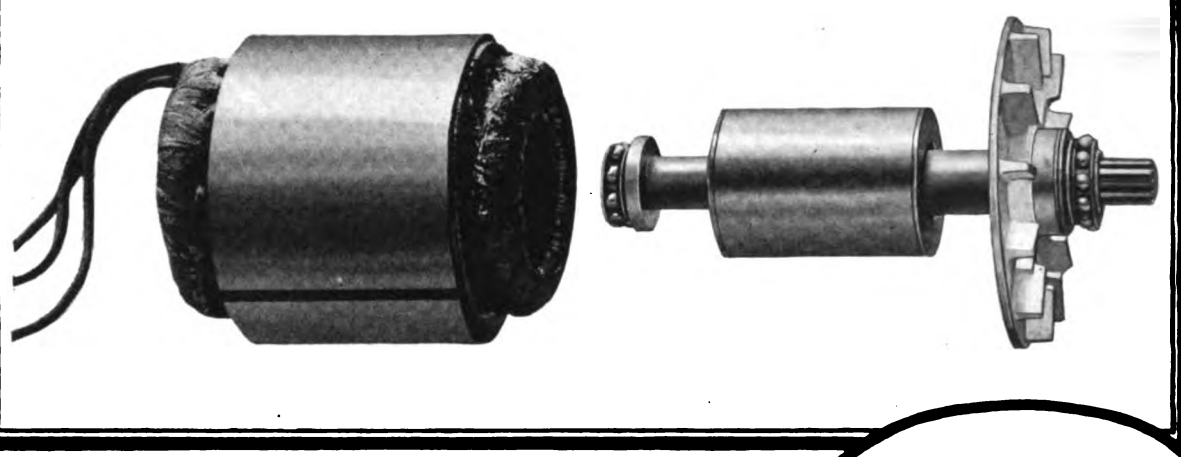
Name of Writer _____

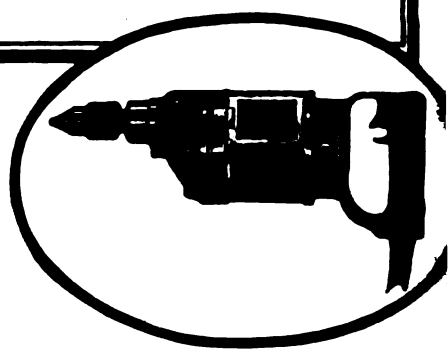
Street Address _____

City _____ *State* _____

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Power and Simplicity





BLACK & DECKER
SUPER POWER PRODUCTION TOOLS

operate on High Cycle A. C. Current

Greater power per pound
No revolving wires
Maintained speed, increasing productive capac
No commutator or brushes

POWER AND SIMPLICITY

This new SUPER POWER line of electric tools is driven by a squirrel-cage type motor, operating on *180 cycle* current. This type of motor has eliminated the use commutator and brushes and, inasmuch as the rotor is made of solid copper bars rivet and welded in position, there are no revolving wires. This fact, together with t elimination of brushes and commutator, removes the source of most frequent serv troubles on electric tools in production work. The rotor is mounted on ball bearin gears are very high grade steel, heat treated, and the motor housing and gear casing, swit handle, etc., are of a superior grade aluminum alloy. Each of the tools in this new SUPI POWER line is marvelously light in weight, outstanding in simplicity, and notewort for long life and stamina.

If you are using ten or more Portable Electric Tools it will pay you to write us complete information regarding the new SUPER POWER tools and the readiness w which an installation can be made.

The BLACK & DECKER MFG. CO.
TOWSON, MD., U. S. A.

Black & Decker Mfg. Co., Limited, Toronto, **Ontario**

Black & Decker, Limited, Slough, Bucks, Eng

advertised in this issue write Industry Illustrated

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Industry Illustrated

For Active Executives, Engineers, Superintendents and Managers

In Mills, Shops & Factories

JOHN R. DUNLAP and MORGAN G. FARRELL *Editors*

W. THOMSON LEES *Associate Editor* ADOLF SCHILDKRAUT *Art Director*

Contents—August 15, 1927

***Note:** This issue, our annual Materials Handling Number, is devoted to the methods in use in the Chevrolet plants. The articles offer a wide range of applications of almost every type of truck, hoist, crane and conveyor, to shop operations of the greatest variety. Material for the articles was assembled by the editorial staff.*

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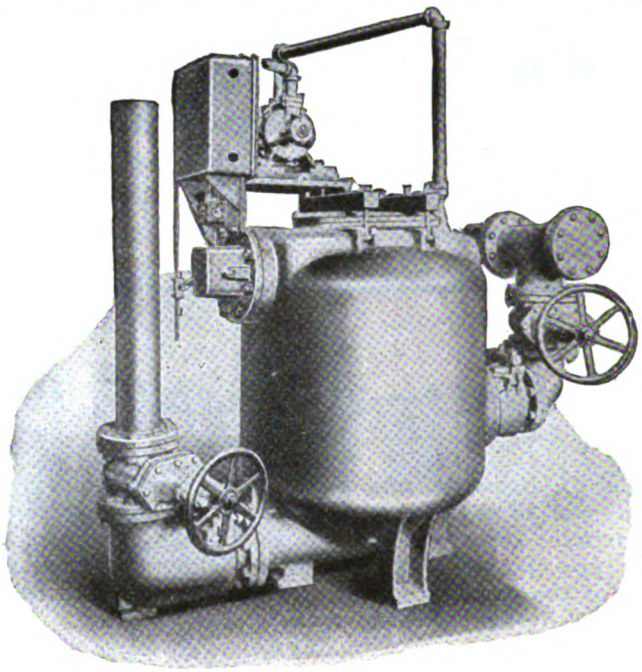
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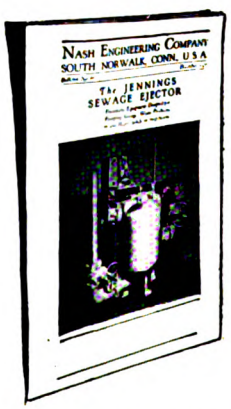
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The Jennings Sewage Ejector, for handling sewage up to 300 g.p.m. against heads up to 50 ft.

Let us tell you more about this sewage ejector—



This bulletin on the Jennings Sewage Ejector gladly sent on request.

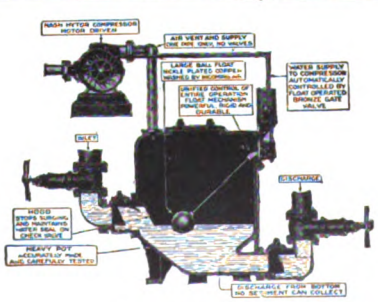
Here we can but mention its simplicity—in construction and in operation. Both make for reliable performance, and for worth-while economies in handling sewage and similar waste liquids.

No high pressure air is required. Nor is there any need for air storage tanks. Complicated air valve mechanisms are avoided. So, also, reciprocating air compressor units and their accessories.

Read the brief explanation below, showing how this Jennings Sewage Ejector works. Then write for our bulletin which gives complete information—including specifications, capacities, dimensions, etc. No obligation, of course.

NASH ENGINEERING COMPANY
92 Wilson Road, South Norwalk, Conn.

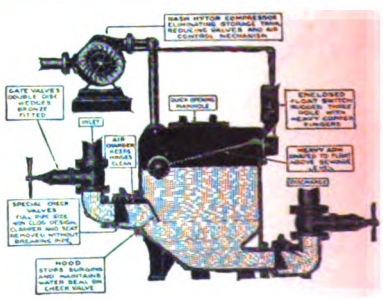
Jennings Pumps



Ejector Filling

Sewage, under the action of gravity, flows through the inlet check valve into the pot. As it accumulates it raises a ball float, which, when the pot is full, actuates a float switch, thereby starting up the Nash Hytor Air Compressor.

Compressed air is delivered into the top of the pot, closing the inlet check valve and expelling the sewage through the outlet check valve. When the pot has been emptied, the float, having reached the lower limit of its travel, opens the float switch, stopping the compressor, through which, then, the air in the pot is vented. Sewage again flows by gravity into the pot, repeating the cycle.



Ejector Discharging

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Graphic Presentation

of a Survey of

Materials Handling Methods

Prepared by Homer S. Trecartin, in Association with W. S. Hays

for

Industry Illustrated

Homer S. Trecartin was chosen to make an independent Survey of the Materials Handling Equipment field for the benefit of the readers of INDUSTRY ILLUSTRATED. Educated as an engineer, and trained as an Industrial Engineer, with the E. W. Bliss Co., General Electric Co., and United Shoe Machinery Co., and experienced in management and sales control positions in industry, Mr. Trecartin has specialized during the past few years in commercial research work. Engaged during 1925 and '26 with the General Motors Corporation on a study of Industrial Markets, he surveyed at first hand the principal industries throughout the country. The first of this year he was engaged by the Power Transmission Association to conduct a survey of their field.

In association with Mr. W. S. Hays, Secretary of the Power Transmission Ass'n, a paper submitted by them was awarded the third prize in the National Industrial Advertisers Association competition for an "Analysis of the Industrial Markets of the Continental U. S. A."

THE data for this presentation of the Materials Handling field was obtained from a direct survey of representative plants in various industries, amplified by a mail questionnaire covering the principal industries.

The results of these surveys showed in a striking way the benefits obtained from investments in materials handling equipment. It was believed that a composite graphic presentation, developed from an *average* of the data obtained, would most concretely visualize the facts.

The first comparison shows the average benefits realized from the utilization of materials handling equipment, in the operating conditions of the companies surveyed. The composite picture of the operating factors indicates how the investment charges for this equipment were offset by savings in non-productive labor expense and the increase in efficiency of the productive labor. The increase in supervision, power cost, factory expense, and maintenance, and the carrying charges of the equipment, are obviously well advised expenditures. In modern industry, money must be spent to earn money.

The second presentation pictures the average of the *returns on investment*, compiled from the responses to the "questionnaire" survey. The examples from the work sheets show that the *average* does not represent the *possible* results.

A study of the individual experiences proves that remarkable returns are not a result of extreme conditions only, where obviously antiquated methods of handling materials would be contrasted with efficient modern equipment. Several instances show that modern equipment has been replaced with still further developed methods, with high annual returns on the later investment.

Many indirect advantages in addition to the direct savings are indicated by comments from the users, of which the following are representative:

". . . business handled with greater dispatch and less demand on floor space."

". . . cut down high labor turnover."

". . . more accurate check on our shipments."

"Material now gets to the right place and gets there on time."

"Material is kept off the floor and is kept moving."

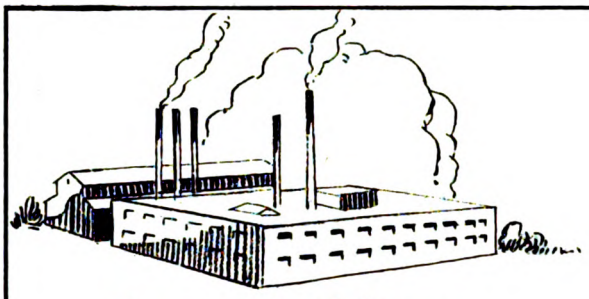
". . . eliminate congestion in aisles and runways."

"Possibilities hardly touched . . ."

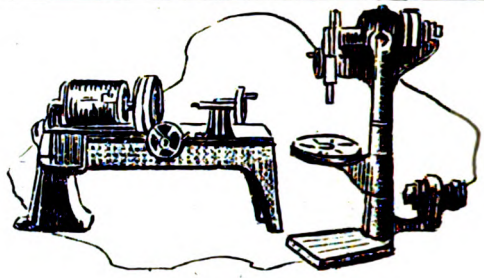
". . . absolutely indispensable as far as running the shop profitably is concerned."



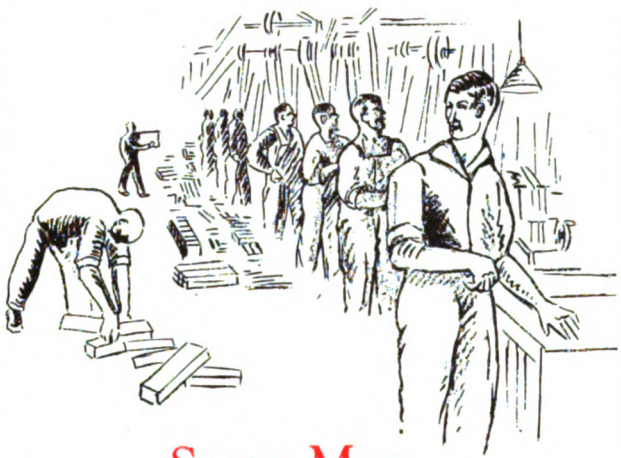
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Same Buildings



Same Tools



Same Men

The Sure Fire Manufacturing Company

Statement of Profit & Loss for Year of 1925.

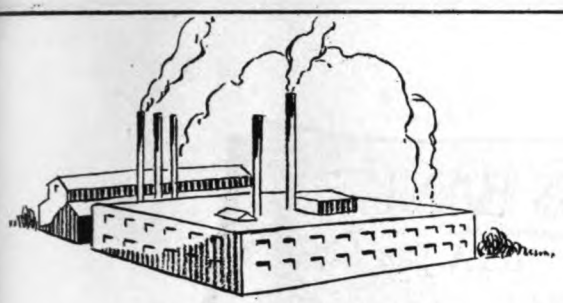
Income from Sales		$706,726
Cost of Goods Sold		
Materials & Supplies	$235,379	
Productive Labor	105,316	
Prime Cost	340,695	
Manufacturing Overhead		
Supervision	17,370	
Unproductive Labor	32,221	
Heat, Light & Power	4,677	
Factory Expense	8,405	
Repairs & Maint. Mchy.	5,120	
Total Mfg. Overhead	67,793	
General Factory Overhead		
Ship. & Rec. Dept. payroll	16,982	
Shipping Matl. & Supps.	1,114	
	17,096	
Storage & Moving of Raw Materials	18,905	
Total Cost of Goods Sold		$444,498
Gross Profit on Sales		262,237
Administrative Expense	41,220	
Taxes, Interest, Etc.	30,871	
Selling Expense	210,215	
		$282,306
Net LOSS		20,06



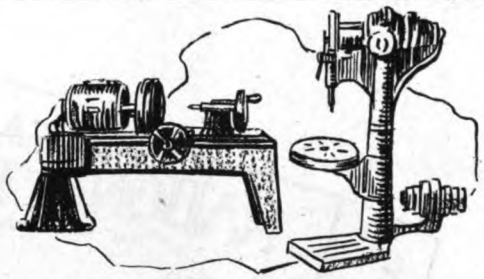
..But

Men waited for materials—Parts were lost—
Orders got mixed—Finished goods were damaged—
Floor space was crowded—Pay Rolls were high

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Same Buildings



Same Tools

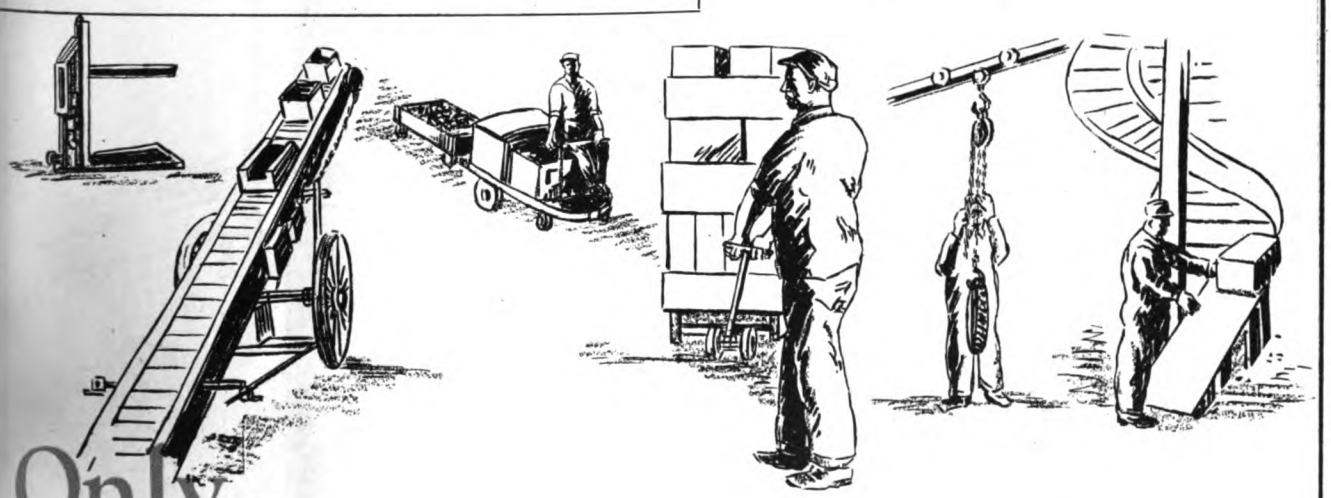
The Sure Fire Manufacturing Company

Statement of Profit & Loss for Year of 1926.

Income from Sales		$736,706
Cost of Goods Sold		
Materials & Supplies	$236,379	
Productive Labor	95,205	
Prime Cost	331,584	
Manufacturing Overhead		
Supervision	18,060	
Unproductive Labor	14,022	
Heat, Light & Power	5,277	
Factory Expense	9,508	
Repairs & Maint. Mchy.	6,200	
Total Mfg. Overhead	53,067	
General Factory Overhead		
Ship. & Rec. Dept. payroll	11,990	
Shipping Matl. & Supps.	1,507	
	13,497	
Storage & Moving of Raw Materials	13,819	
Total Cost of Goods Sold		$411,967
Gross Profit on Sales		324,739
Administrative Expense	43,120	
Taxes, Interest, Etc.	32,179	
Selling Expense	212,301	
		287,600
Net PROFIT		37,139



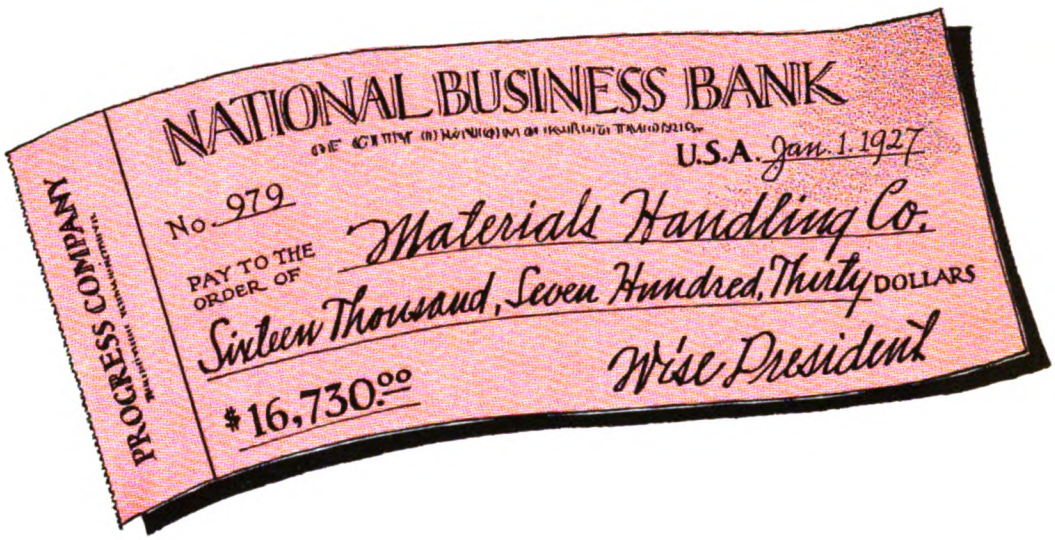
Same Men



Only..

**Mechanical handling equipment eliminated delays—
Speeded production—Brought order out of confusion—
Saved breakages and damage—Cut down labor costs—
Changed loss to profits**

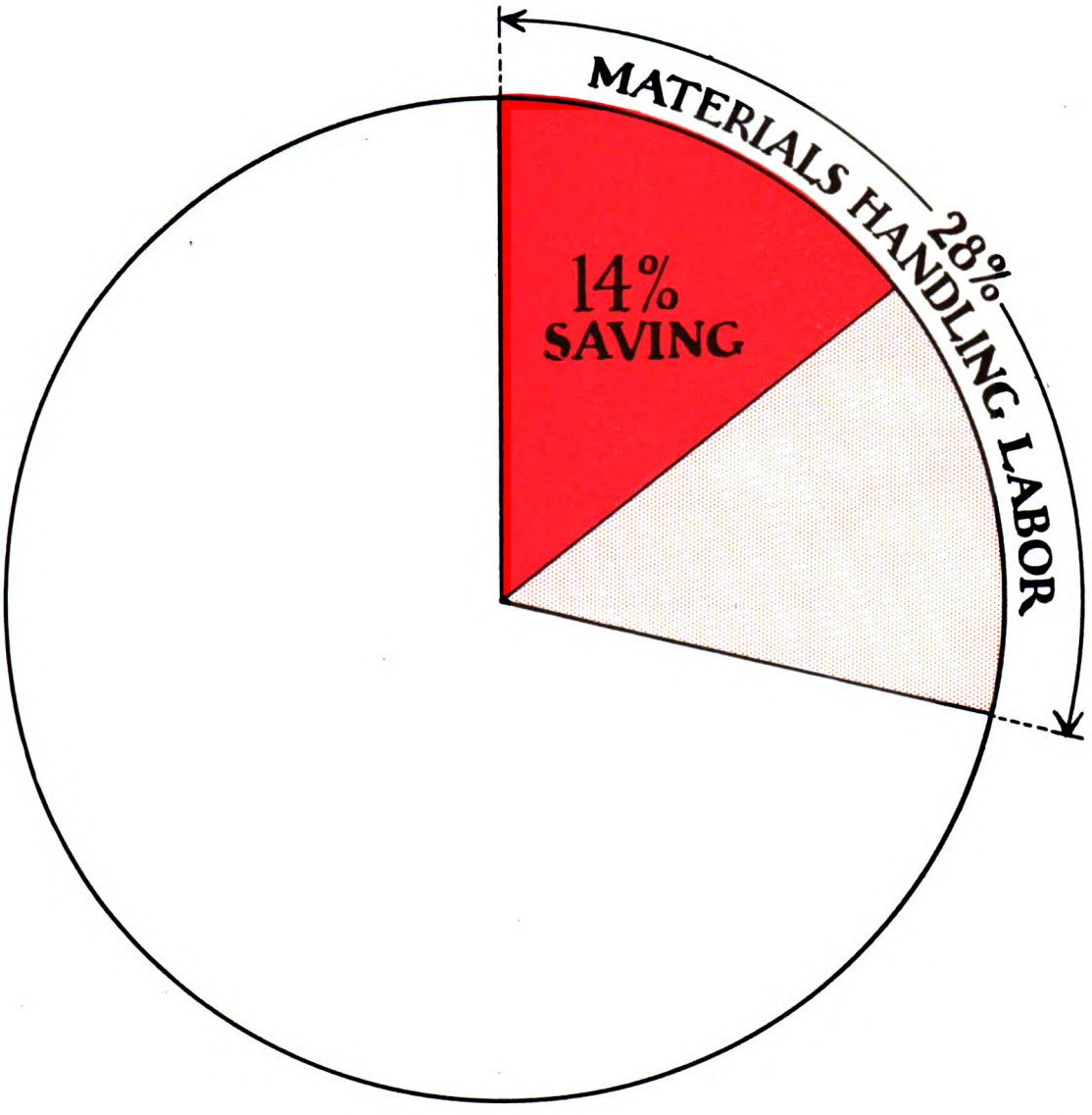
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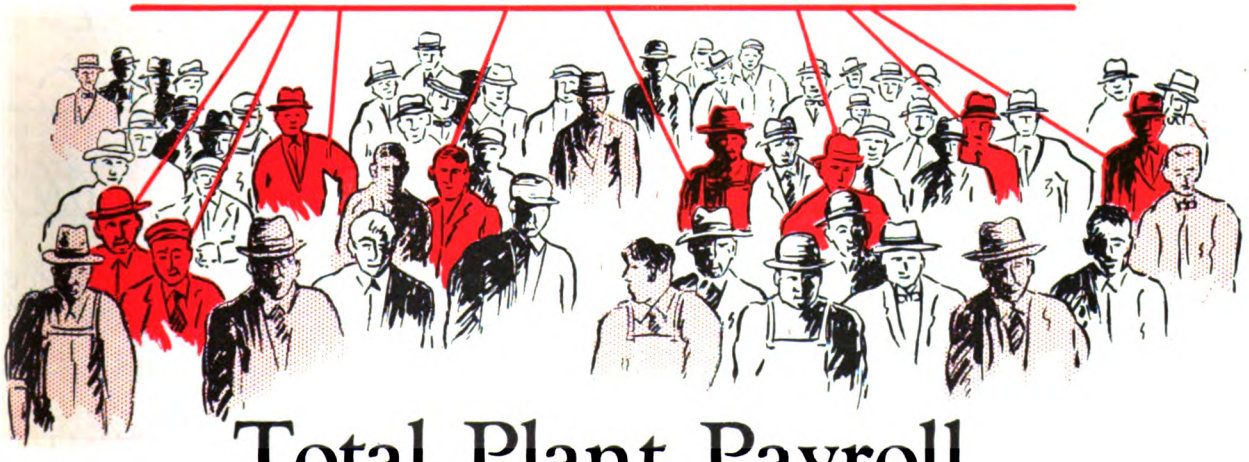
This saved the cost of paying these eight men 45¢ an hour each year



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Materials Handling Equipment Released These Men for Productive Work



Total Plant Payroll

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Mechanical Handling Pays From 10 to 1000 Percent Dividends

EQUIPMENT	COST	SAVING IN 1926	% ANNUAL RETURN ON INVESTMENT
1	4,100.	8,446.	206%
2	2,005.	3,409.	170%
3	17,900.	22,196.	124%
4	35,189.	38,707.	110%
5	4,800.	28,800.	600%
6	1,600.	16,000.	1000%
7	6,500.	4550.	70%
8	9,500.	1900.	20%
9	1,800.	180.	10%
105	37,000.	185,000.	500%
106	93,900.	140,850.	150%

A Good Investment for Industry!

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In amplification of the survey a questionnaire was mailed to cover the 51 chief industries.

The figures used to develop average results were taken only from the returns furnishing complete information with full supporting data.

This develops that:

In 106 plants

an investment in

MATERIALS HANDLING EQUIPMENT

of

$1,118,580

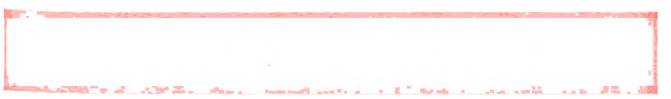
showed an annual return

on the investment

of

$1,623,820

in *direct* savings



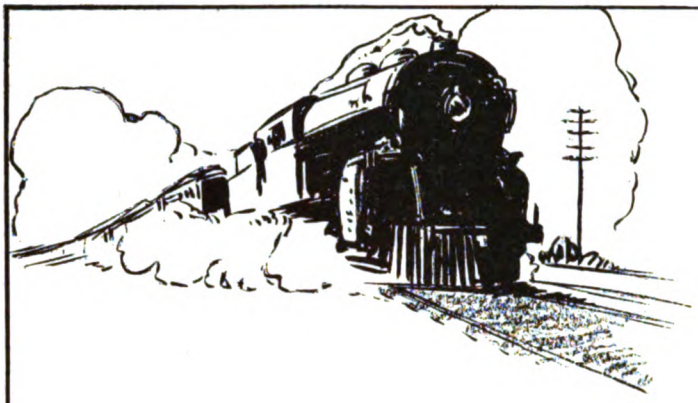
The Investment

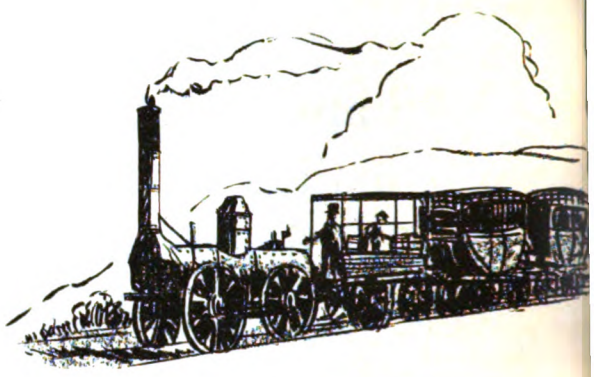


The Savings

A mail survey disclosed these average results for 106 plants

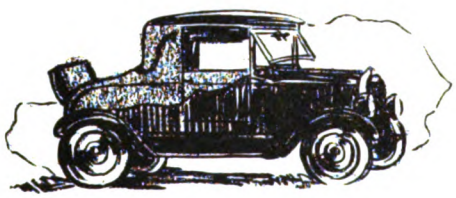
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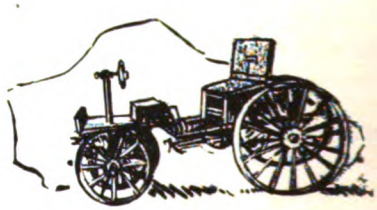




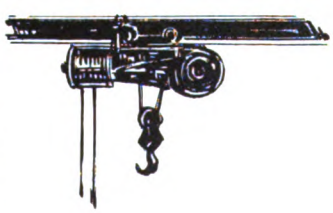
"...A profound change was taking place—a change from high cost to low cost methods. Old capital, representing obsolete method—that was perishing..."

Garet Garrett, Saturday Evening Post, April 30, 1927.





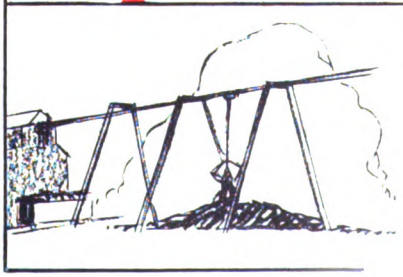
Move materials mechanically

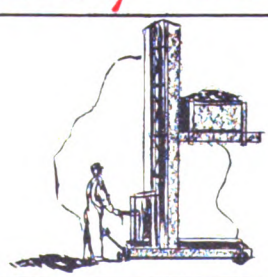


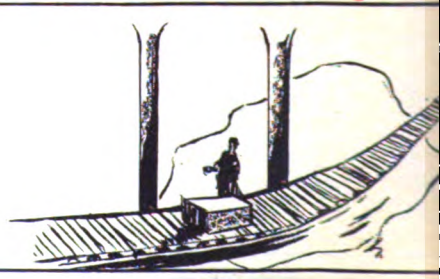




Spend money to save money







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Handling One Million Tons of Parts Through Production Each Year

How the Chevrolet Plants Are Equipped to Transport Between Operations the Material for 100,000 Cars a Month

Under the decentralized policy of manufacture of the Chevrolet Motor Company, each plant is a highly specialized unit devoted only to the production of certain parts, which are finally brought together in the Assembly Plants.

This is the ideal condition for the use of handling equipment.

The handling problems which have been successfully solved are so varied that we have devoted this entire issue to Chevrolet's accomplishments. Our readers will find herein methods which are applicable to their own shops either directly or suggestively.

The Chevrolet Motor Company has made an invaluable contribution to the advancement of handling science by assisting our staff to publish these illustrated articles.—*The Editors.*

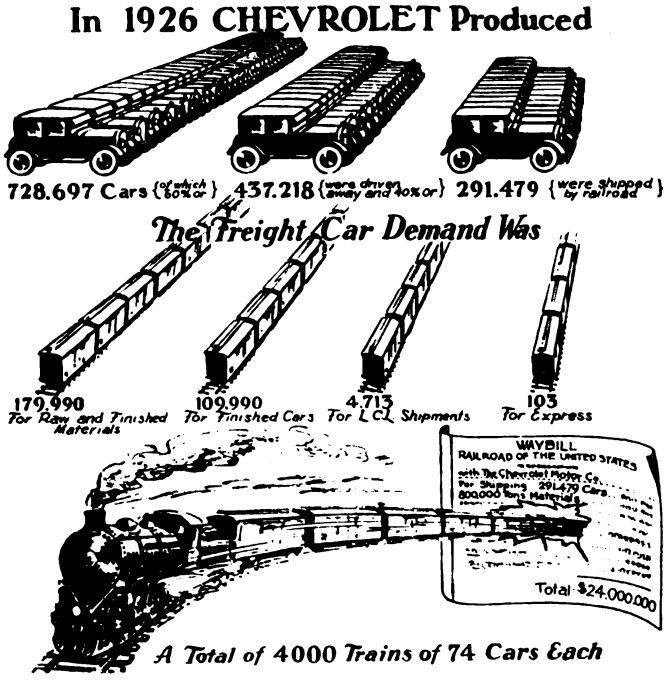
IN 1909, Louis Chevrolet was experimenting on a six-cylinder car in a small shop in Grand River Avenue, Detroit. For two years he patiently continued in experimental work which culminated in the completion of four or five cars in 1911. On November 3rd of that year, the Chevrolet Motor Company of Michigan was organized with Louis Chevrolet, William H. Little and Edwin R. Campbell as incorporators. Mr. Campbell was W. C. Durant's son-in-law.

The first Chevrolet models were brought into production in a rented plant on West Grand Boulevard. Two years later, in 1913, the company moved from Detroit to Flint and continued operations in the old Imperial Wheel Company plant on property now owned by the Buick Motor Company, from which, in another two years, they moved to the Flint Wagon Works plant.

Meanwhile a plant was rented at 57th Street and 11th Avenue, New York City. In 1914 the Flint and New York plants began production of the Baby Grand Touring Car and Royal Mail Roadster, the sales of which soon showed substantial gains.

The year 1915 marked an epoch in the development of Chevrolet. The Chevrolet Motor Company of Delaware was organized with offices in New York City. As a holding company, it took over the complete management. W. C. Durant was president, W. C. Sills, General Sales Manager, F. W. Hohensee, Production Manager for all plants including those operated under agreements. At this time the Tarrytown plant was purchased from the Maxwell Motor Company.

Durant now made a proposition to the Board of Directors of the General Motors Company to take over Chevrolet as a unit, which offer was refused. He then announced that Chevrolet would take over General Motors. He secured control of General Motors by issuing five shares of Chevrolet stock for each share of General Motors stock offered. This, together with the holdings of himself and friends, gave him control.



From this point on, the developing of Chevrolet continued rapidly, particularly after the post-war reaction of 1920 and 21. We are not concerned here with the changes of sales policy which mark the same period. It is also unnecessary to go into the details of acquisition of new plants.

It is sufficient to state that in 1926 Chevrolet produced 728,697 automobiles, while today the company is the world's largest builder of gear-shift automobiles. For several months past, the production has exceeded 100,000 cars a month.

The actual production is carried out in the four principal Chevrolet Manufacturing plants and in five plants controlled by the General Motors Corporation. There are, in addition, eight district assembly plants (including one in Canada) and an export plant.

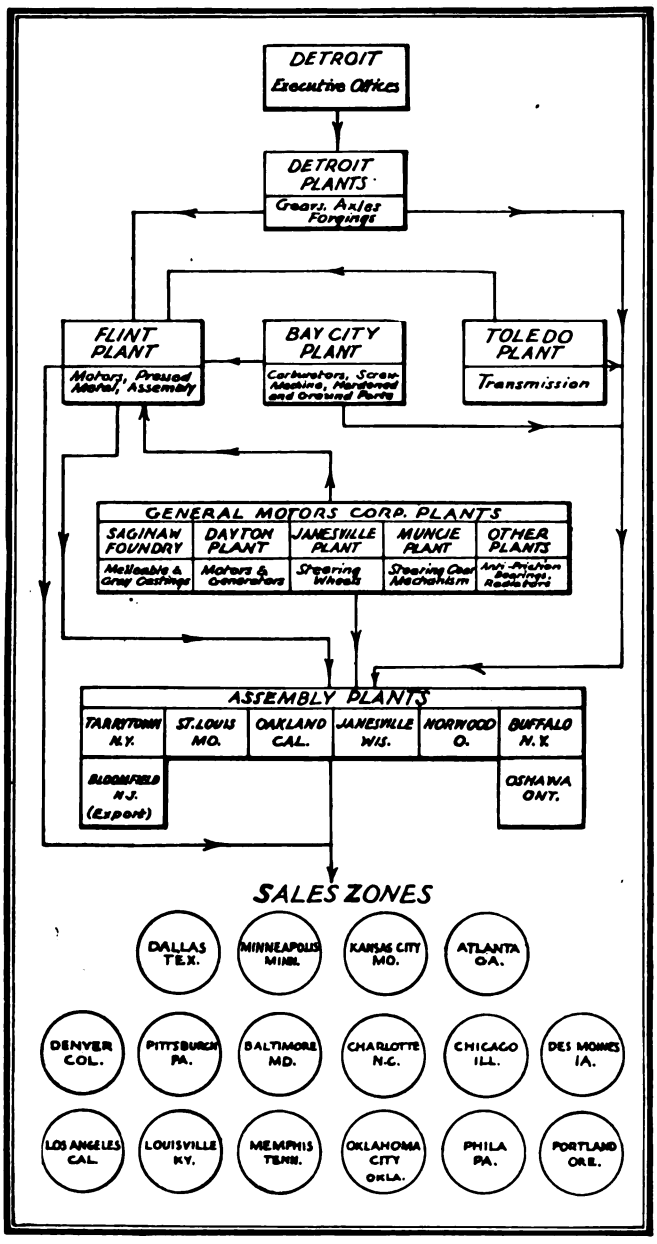
To merchandise the product, the country is divided

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into sixteen sales zones. One retail store is operated at Broadway and Fifty-seventh Street, New York City. The principal executives of the Chevrolet Motor Company are: W. S. Knudsen, President and General Manager; C. F. Barth, Vice-President in Charge of Manufacturing, and R. H. Grant, Vice-President and General Sales Manager; O. E. Hunt, Chief Engineer.

Decentralized Manufacturing Policy

Just as the Buick, Cadillac, Chevrolet, Oakland, Pontiac, Oldsmobile and Fisher Body Group are operated,



The diagram shows the principal Chevrolet production, assembly and sales units and their inter-relation.

each as a division of General Motors, with a self contained organization but with centralized control, so, in a sense, are the individual manufacturing plants of Chevrolet operated as specialized units under general executive control. A glance at the adjoining plant chart will make our meaning clear.

The manufacturing set-up is as follows: gears, axles and forgings are made in Detroit; transmission in Toledo; carburetors and small parts which hardened, ground or made on screw machines, i gaso-line motors and pressed metal parts such as chassis, fenders, hoods and tanks in Flint. These are exclusively Chevrolet divisions.

Under the General Motors type of organization, there are fifteen divisions (other than the Fisher Body Group), manufacturing components and accessories which enter into the product of two or more car divisions. Thus components and accessories for Chevrolet are supplied as follows: Malleable iron and gray castings from Saginaw; starting motors and generators from Dayton; steering wheels from Janesville; steering gear mechanism from Muncie; anti-friction bearings, radiators, etc., from other plants. The Fisher Body Group includes distinct units supplying lumber, glass, hardware and other materials to the final body manufacture units. One of the last named supplies Chevrolet bodies exclusively.

In addition to all these divisions, there is an independent division handling the assembly and sale of all cars in Canada and an export group handling the assembly and sale of all cars in other foreign countries.

Under this system of manufacturing organization, it is obvious that each plant must consist of one or more units engaged in the manufacture of sub-assemblies. Thus the number of operations carried out in each unit is reduced to the minimum necessary for the production of its output. At the same time, quantity production is at a maximum because those same parts are made exclusively at that unit.

It is therefore possible to make use of handling systems which might not warrant their installation, if entire cars were manufactured in a like number of plants scattered about the country.

The Principal Manufacturing Units

1. The Detroit Plants include the following units:

(a) The Drop Forging Unit.

(b) The Front Axle Unit where the disc-wheels, except the felloe bands, the brake-drums and the rear axle hubs, are made.

(c) The Drive Shaft Unit, where the rear axle gears are also made.

(d) The Heat Treatment Unit for all axle and drive shaft parts.

(e) The Stampings Unit, where parts of this class for the axles and brake mechanism are stamped out. In this unit are also the brake assembly, the rear-axle assembly, painting and shipping.

2. The Flint Plant includes:

(a) The Motor Unit where the motor is manufactured and assembled.

(b) The Pressed Metal Unit where the sheet metal parts for the chassis are formed.

(c) The Flint Assembly Unit where chassis are assembled and shipped or driven away.

3. The Bay City Plant, where small parts are made.

In the succeeding articles, the handling and transportation system inside each one of these units will be discussed independently. There is a great difference between the nature of the operations and the shape, size and variety of the parts handled in each unit. Therefore the conveying, hoisting, trucking methods and equipment differ to a considerable extent. Hence the handling stories of all the units will represent a series of different methods, rather than a duplication of the same ones. The sequence of the articles, however, has no relation to the sequence of manufacturing operations

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The Drop Forge Unit in Detroit

Summary of Operations

THE Chevrolet Drop Forge Unit is one of the largest plants of its kind in the world. The two main buildings have a combined floor area of fourteen acres.

It produces drop forgings for the front axle, rear axle, drive-shaft and brake parts. It also turns out crank-shafts, connecting rods and other motor forgings as well as gear blanks and transmission parts. The diagram at the foot of the page shows how the output of the drop forge unit is distributed to the plants where it is consumed.

It may be explained that the rear axle unit is on the same tract as the drop forge unit. The front axle unit is also on the same tract, but directly across the street from the drop forge unit. The three are connected by concrete roadways. Electric trucks or tractors with trailers are the means of transportation between them.

Crank-shafts, connecting rods and other motor forgings are shipped by rail to the motor plant at Flint while gear-blanks and transmission parts go, by rail, to the Toledo plant. This necessitates a completely equipped packing and shipping department.

The Detroit forge unit is therefore the central production point from which all forgings used in the manufacture of cars are distributed to other plants where they are finished and assembled and again distributed to the general assembly plants.

Manufacturing Processes

The same principle is carried through the entire cycle of manufacturing, namely: (a) Central production of parts, (b) Distribution to sub-assembly plants and (c) Distribution to final assembly plants. There is no doubling back in the flow of material but a constant fanning out from the central point of origin.

The principal process departments in the drop forge plant are: (a) Bar stock storage, (b) Cutting shears, (c) Main forge equipped with steam hammers, (d) Full-length-bar forge equipped with board hammers, (e) Heating and annealing furnaces, (f) Pickling and washing, (g) Straightening presses, (h) Rattlers, (i) Sorting conveyors, (j) Scrap disposal, (k) Repair shop, (l) Shipping.

The operations in the forging process will be discussed in connection with the methods of handling materials to and from them, in the following pages.

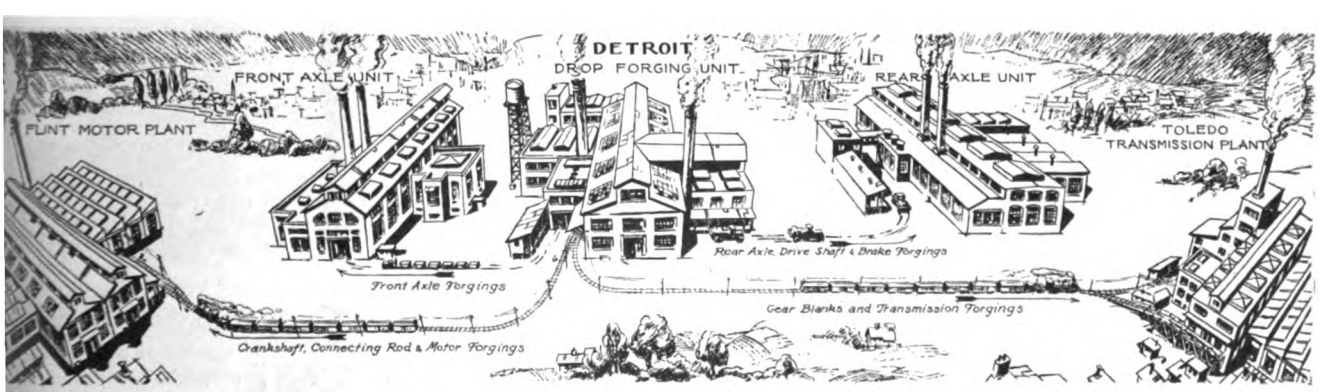
Producing 10,000 Tons of Forgings a Month

There are 118 forging hammers of both steam and board types in the plant. Their capacities range from 1,000 to 6,000 pounds. Those which are used for forging crank-shafts can turn out 900 shafts per hammer in twenty-four hours. The plant produces 10,000 tons of finished forgings each month which requires about 12,500 tons of raw materials. Fifteen different kinds of steel are used in Chevrolet forgings, mostly in the shape of bars or rods.

As shown on the next page, the forge plant is a long one-story shed of the monitor type in which ventilation is assisted by the numerous hoods on the roof of the monitor.

The platform for the receipt and storage of incoming stock extends the full length of the building. It is served by a rail siding also extending throughout the full length of the platform.

Cutting shears are located in sheds placed at intervals along the stock platform. Outside of each cutting shed is a steel roller table similar to a gravity conveyor upon which the bars of steel are placed. One operator handles material along the roller table to the shear operator who cuts the stock the proper length. Each shed supplies material to the nearest group of hammers and to cut stock storage bins on the side of the platform nearest the forge shop. The bars are now ready for processing and the system of handling them through the several operations is described in the following article.



How the drop forgings are distributed from the central plant in Detroit to the points of use.

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Fig. 1. The center aisle in the principal forge shop. Steam hammers are on either side and the crane for handling dies is in the center.

Electric Cranes and Lift Trucks Move Stock in Drop Forge Unit

TRAVELLING cranes play an important part in handling the raw and partly processed material through the plant. For instance, the crane in the above illustration is used for bringing in and removing dies when they are to be changed and in repair work on the hammers and their machinery. It runs the full length of the main forge shop. The bar stock platform is served by three bridge cranes which travel upon a runway, one side of which is bracketed out from the building, while the other is supported on a trestle as shown in Fig. 3. The cranes span both the bar stock platform and the railroad siding. Bars are received in gondola cars in which they are unloaded by lifting magnets suspended from the crane hoist, and are deposited on the proper racks. When the bars are required the magnets lift them out of the racks and place them on the roller table at one of the shear units. The same cranes are used for picking up scrap from the platform where it is accumulated and loading it in outgoing cars.

The cut bars are stacked on steel skids with fixed ends and sockets for side stakes. (See Fig. 4). An electrically driven lift truck picks up the loaded skids and brings them to the proper hammers. Here the pieces of stock are removed from the lift truck skids, one at a time and placed in the heating furnace. When heated to the proper temperature they are passed by hand to the hammer operator or his assistant. He places them in the drop.



Fig. 2. A general view of the Chevrolet drop forge unit. Incoming tracks serve the bar stock platform at the left. Machine shop in the foreground.

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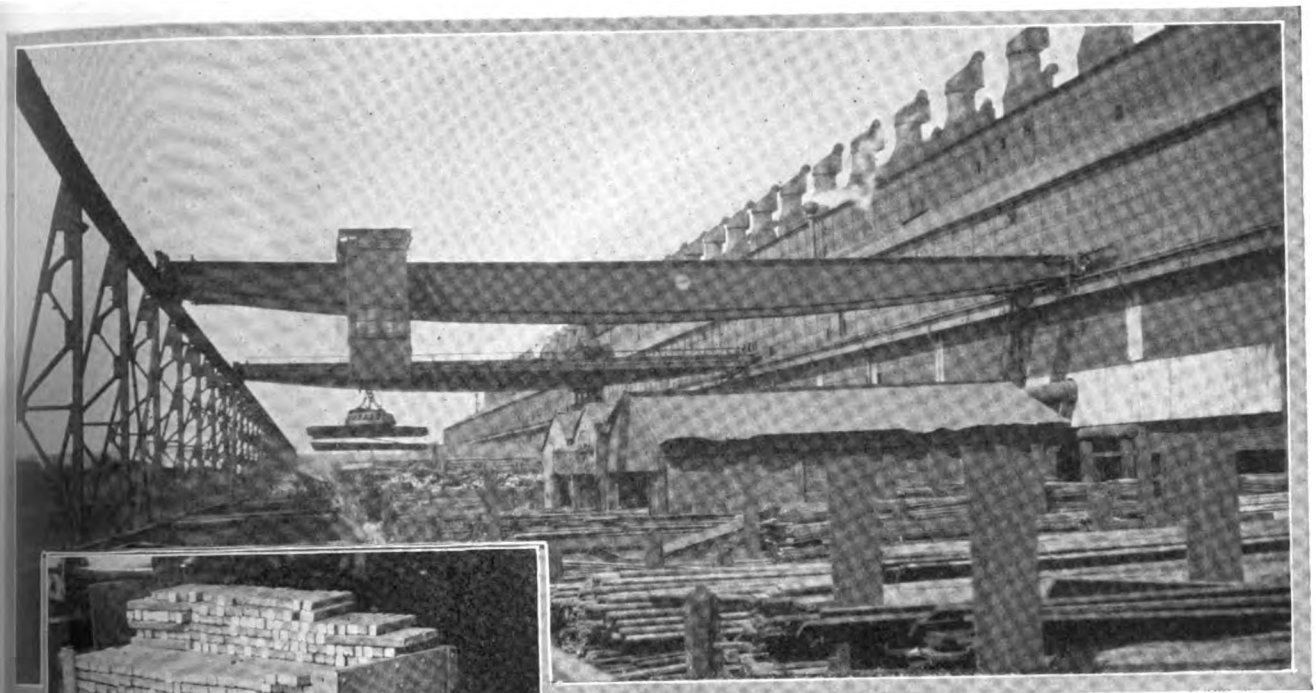


Fig. 3. Above: Bar stock being unloaded by travelling cranes equipped with magnets. It is stored on the platform until ready for cutting in the shear sheds.

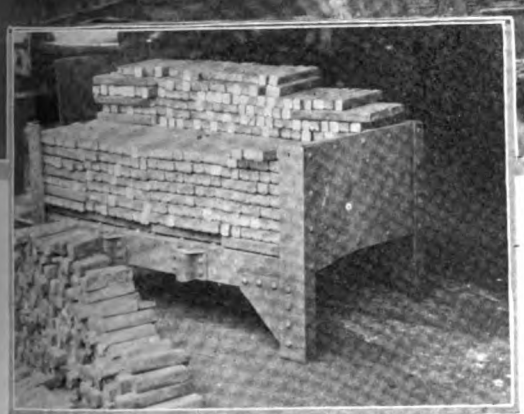


Fig. 4. Left: Skids upon which cut bar stock is loaded for transportation by lift-truck to the hammers.

the forging is finished in a single hammer, the dies are usually arranged to trim the flash from the forging, otherwise a trimming press is provided for the purpose, after which the finished forging is again placed on a lift truck skid.

If more than one set of dies is required to complete the forging, the stock is passed by hand through several heating furnaces and under several hammers. In some cases, as in forging front axles, an additional straightening operation is required, following the last hammer. Where the arrangement of hammers and furnaces and the nature of the forging permit, the part in process is passed from operation to operation, by means of hangers carried on overhead trolleys.

Where finished forgings must be washed, as in the case of front axles, they are passed through a sunken tank on a slat conveyor as shown in Fig. 6.

Hammered forgings awaiting further processing, as annealing, are stored in skid boxes in the paved space between the two forge shop buildings as shown in Fig. 7. Two types of skids are used for handling forgings, each of which is made up in two styles. One type is fitted with either solid ends or metal corner posts. The other type is the ordinary box skid. It is made in two sizes. One is the largest the lift truck can accommodate and the other half that size. The smaller one is used for handling very small forgings.

These small forgings are made largely



Fig. 5. Lift-truck which delivers cut stock either to the hammers or to storage space just outside the forge shop.

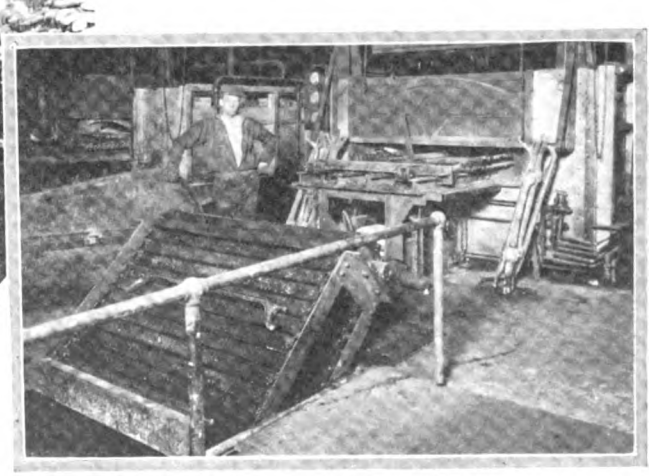


Fig. 6. Power driven slat conveyor which carries front axle forgings through washing machines.

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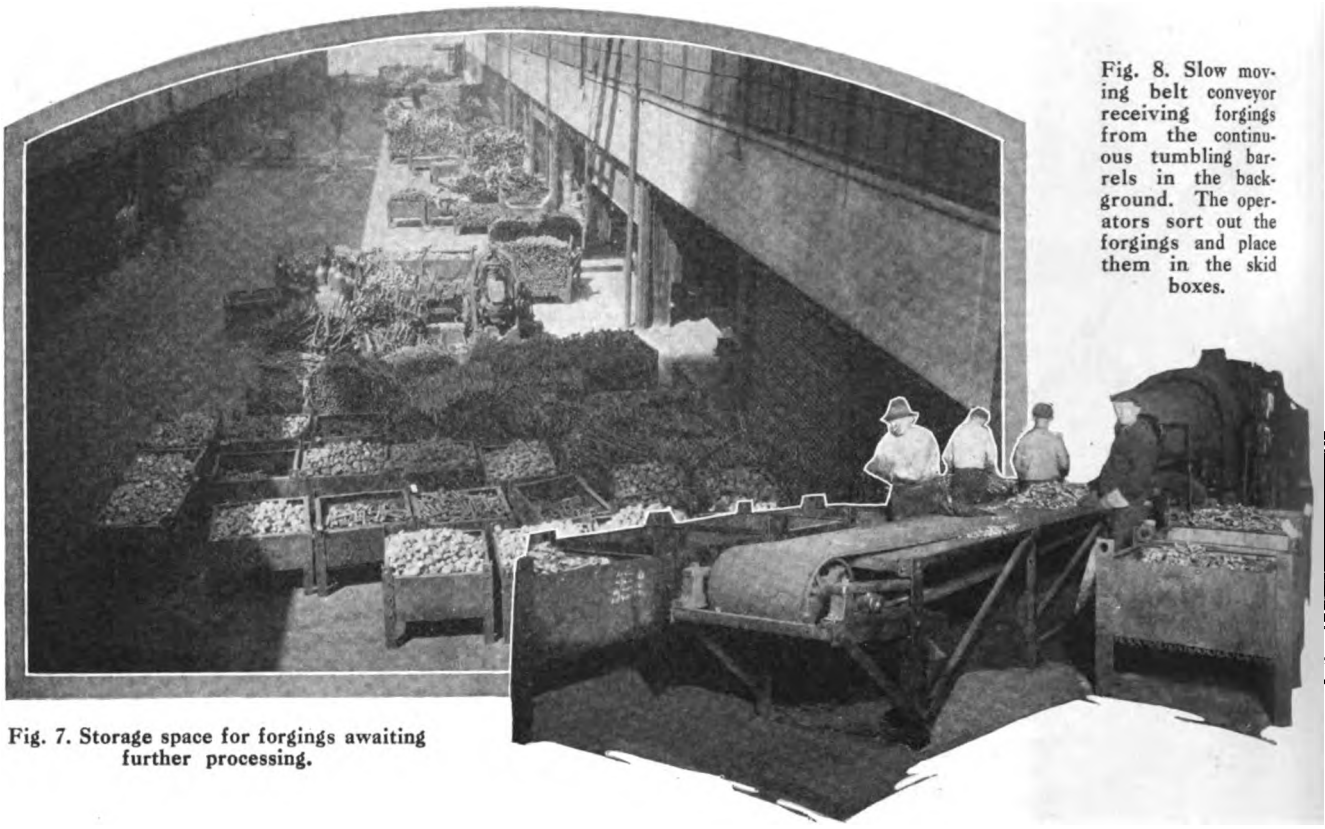


Fig. 8. Slow moving belt conveyor receiving forgings from the continuous tumbling barrels in the background. The operators sort out the forgings and place them in the skid boxes.

Fig. 7. Storage space for forgings awaiting further processing.

under board hammers. Uncut bar material is used for the purpose. Stock is brought into the plant on trailers drawn by tractors. In this same section of the plant there are two rows of small power presses which are used to straighten forgings and trim off the flash. Between the rows, there are two slat conveyors, one above the other on the same supports. They travel in opposite directions. The top one carries scrap and flash to the dump-bucket skid shown in Fig. 9. The one below carries forgings to a continuous tumbling barrel. The end of this conveyor nearest the tumbling barrel is shown in Fig. 10. As the forgings pass from the tumbler, they fall on a power-driven endless belt conveyor, where they are sorted out by workmen into the various skid boxes as shown in Fig. 8.

Metal dump bucket skids of two types are employed to handle scrap and flash (usually hot) from forgings. One is a side-dump and the other an end-dump bucket. The first is shown on Fig. 9 and 11 and the second in Fig. 14. They are loaded with scrap at the hammers, presses and other points where it accumulates. When full, they are raised on lift trucks and carried to a scrap bin on the bar stock platform. When sufficient scrap has accumulated it is loaded by the same three electric cranes and magnets used to unload raw materials.

An important department of the plant is the machine and repair shop. It is located in a separate building. In it all forging dies are made. These are handled as shown in Fig. 13 by an electric lift truck which moves them between the machine shop, the storage racks and the hammers. In spite of their great weight, they are thus easily delivered at the proper level to a shelf or machine table.

The other handling devices in the shop include hand

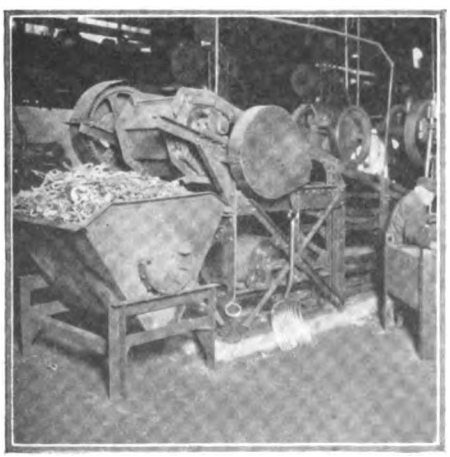


Fig. 9. The end of the conveyor between the trimming presses. It delivers scrap and flash to the dump bucket skid.

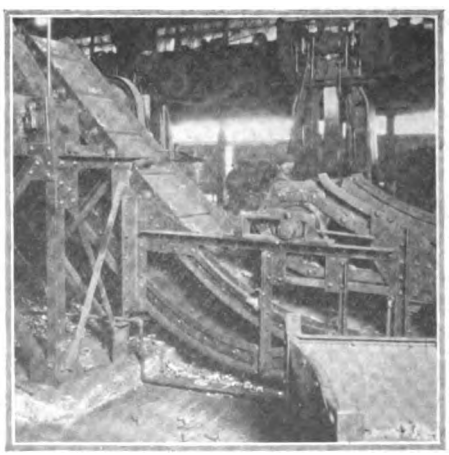


Fig. 10. The end of the conveyor [illegible]h is under the one shown on [illegible]. It delivers forgings to [illegible]inuous tumbling barrel.



Fig. 11. Side dumping bucket skid for scrap. Lift-trucks transport the skid to the scrap pile to be emptied.

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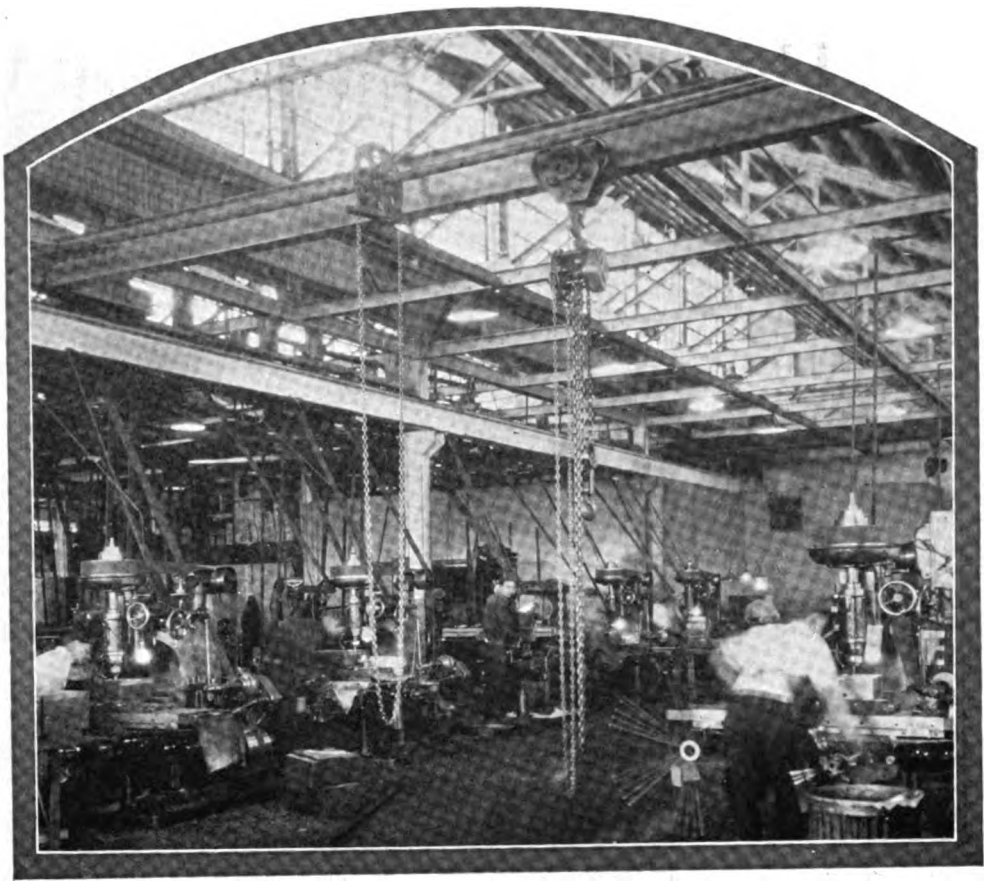


Fig. 12. A view of the machine and repair shop. The dies for the hammers are made here and removed to the racks by lift-truck. The principal handling equipment includes hand operated travellers and hoists.

and pneumatic hoists, chain blocks and hand-operated trolley hoists as shown in Fig. 12.

As the steam hammers create a considerable demand for steam, there is a modern, well equipped boiler house on the plot to be described later, together with other miscellaneous plants.

In following the stock through the various operations in the process, it will be seen that there are very few gaps in the continuous system of mechanical handling. The raw material and heavy parts are handled by the traveling cranes. Conveyors are used wherever possible for washing, tumbling, sorting and scrap collection; while, between operations, the electric lift-truck and tractor are used for the transport of materials. In fact, the only points at which materials are moved by hand are those at which it is cheaper to handle them that way.

While the production volume in the Chevrolet drop forge unit is a large one, its operations are essentially the same as those of plants producing similar parts on a smaller scale.

Most of the handling methods are therefore adaptable to other drop forge plants which produce in sufficient volume to keep at least one unit of each kind of the handling equipment busy. The system of unloading bars and loading scrap is adaptable to almost every drop forge plant since a traveling crane at the receiving platform would be a necessity in any case. The same applies to the power lift-trucks and even to the conveyors. It is well to bear in mind the decentralized manufacturing methods of the Chevrolet organization. Each manufacturing unit presents different handling problems; and the methods used are applicable, in general, irrespective of huge quantity production.

Fig. 13. How the electric lift-truck is adapted to the handling and storage of heavy dies. The operator is shown delivering a die to the proper shelf in the storage rack.

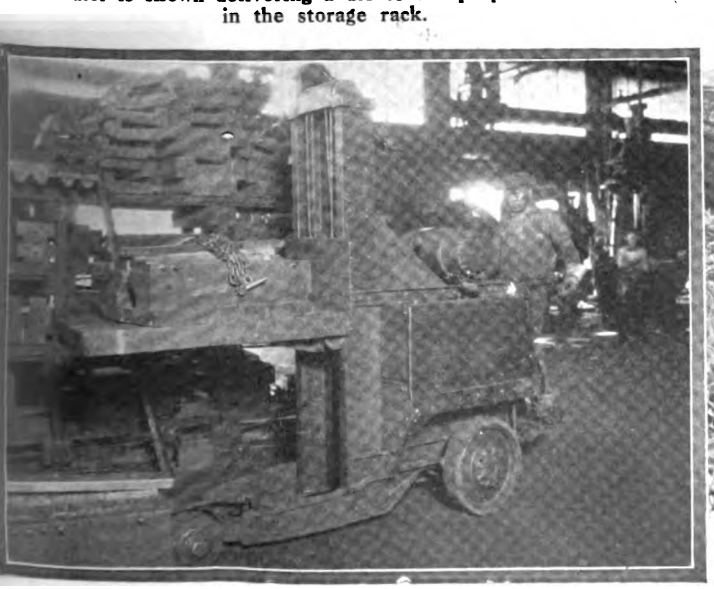




Fig. 14. Here an electric lift-truck has picked up an end-dump bucket skid full of scrap and is about to empty it on the scrap heap.

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Heat Treatment and Washing Operations Timed by Conveyors

Special Carriers Are Used to Protect Accurately Machined Parts Against Damage

ONE of the four units in the Detroit plant is the building devoted to the heat treatment of gears and shafts for the front and rear axles which are produced in adjoining units at the same plant. In it, annealing, carbonizing, pickling and washing operations are performed.

A considerable proportion of the parts which pass through these operations have already been accurately machined and highly finished, so that great care is necessary in handling them through the process. Fig. 1, for instance, shows how the drive shafts are handled through the annealing oven. They are brought to the oven on steel skids with pressed metal sides like those used in the drop forge plant. Electric lift-trucks furnish the power to move them. The operator takes them from the skids and places them upon the apron of a conveyor, which is an integral part of the annealing furnace. They travel slowly through the fire-box, while reaching the desired temperature. They are then elevated at the back of and returned to the front of the furnace, sliding down the chute at the right to another set of skids, ready to remove them to the next operation.

A similar method is employed for washing the ring gears, see Fig. 2. The gears are placed in screen pans and are fed into the washing machine through which they are carried by a continuous power driven conveyor.

In both these op-

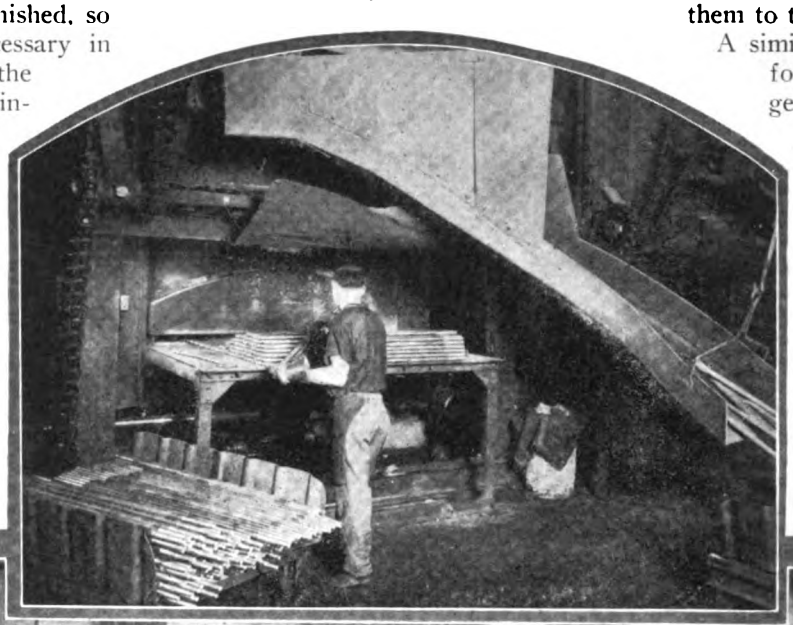


Fig. 1. Right: Drive-shaft annealing oven equipped with continuous conveyor and return chute.

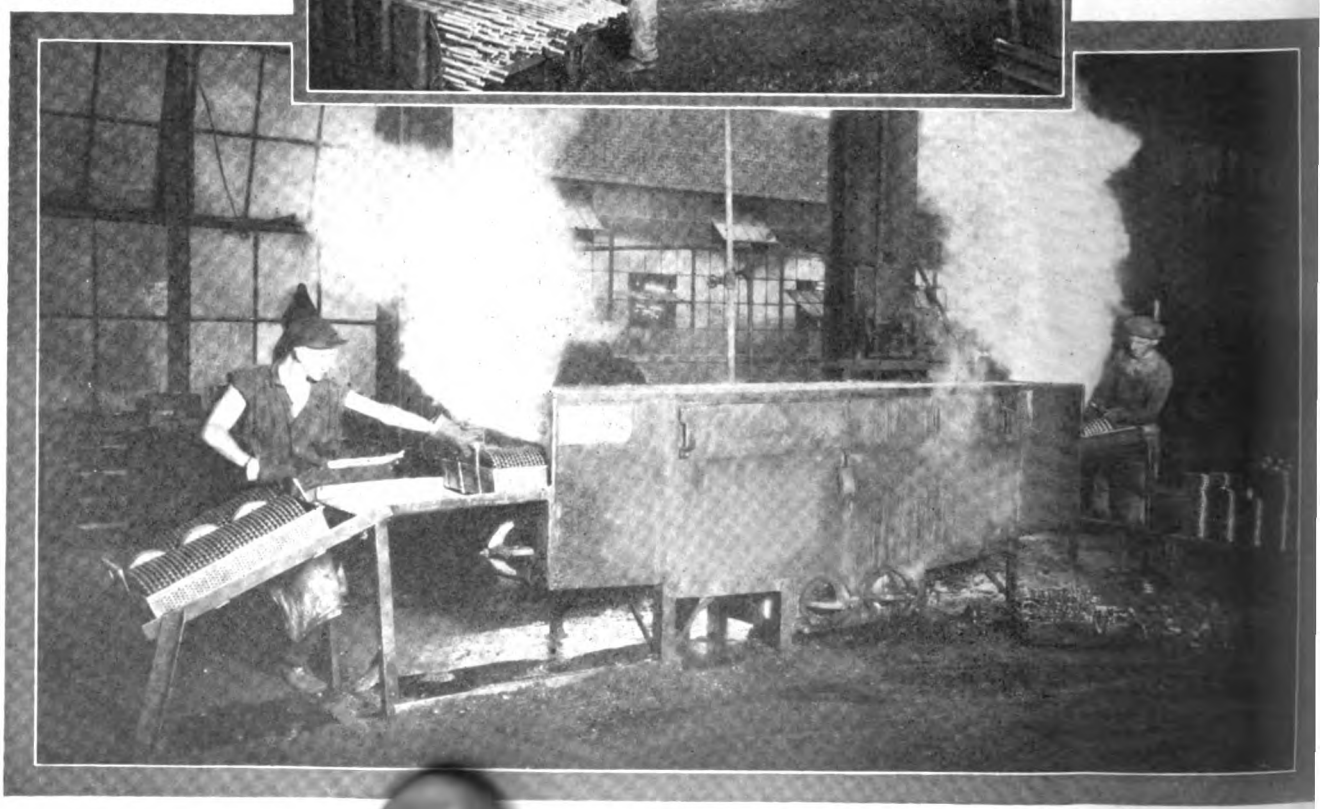


Fig. 2. Below: A continuous conveyor system applied to a washing machine for ring gears.

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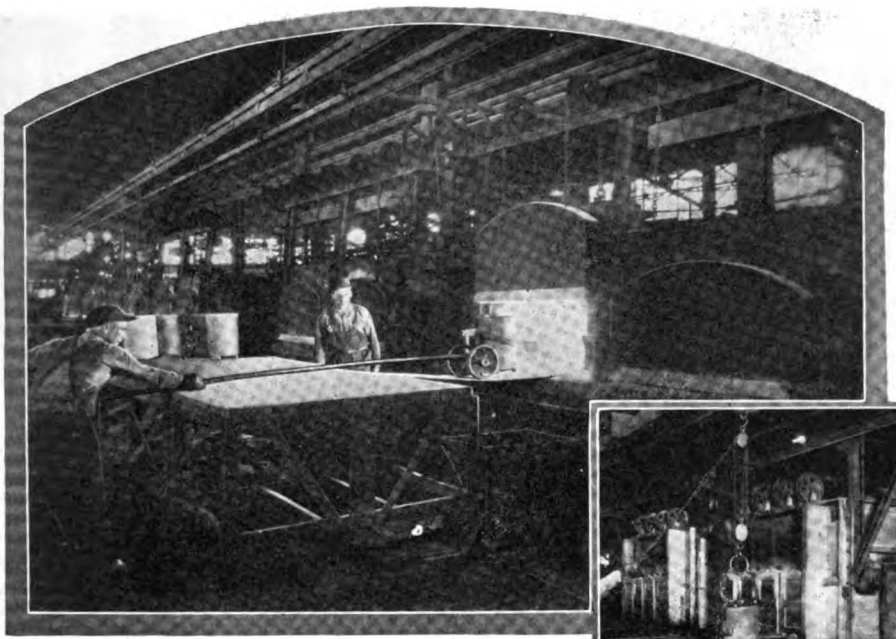


Fig. 3. Right: Charging a carbonizing furnace. The loaded pots have been brought to the oven on the steel skids which appear in the foreground.

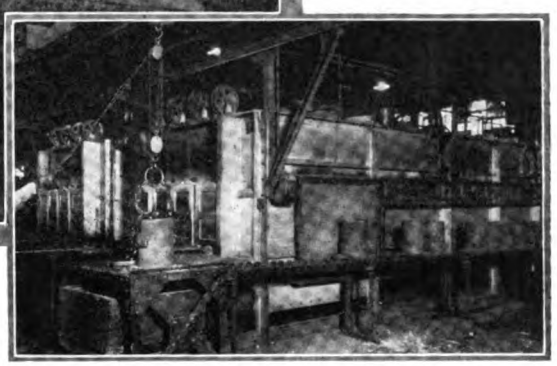


Fig. 4. Below: Another type of carbonizing furnace. The pot at the left is about to be emptied while those at the right are returning on a gravity conveyor to be reloaded.

erations, the speed of the conveyor is, of course, timed according to the required duration of the operation.

Small parts to be carbonized are placed in pots on platform skids as shown in Fig. 5. An electric lift-truck takes up the skids with the charged pots and brings them around to the front of the carbonizing furnace shown in Fig. 3. There they are picked up by a two-wheel tong truck and pushed into the furnace by the operators. They are removed in the same way.

Another form of carbonizing furnace is shown in Fig. 4. Here all the operations are performed with mechanical equipment. The loaded pots are placed on a slow moving conveyor which carries them through the furnace to the end shown in the illustration. They are pulled out on roller conveyors and emptied by means of an overhead hoist. The particles of carbon fall through a screen into containers placed under the platform, on which the pot stands. Carbonized parts are then taken to the quenching tanks, while the empty pots are returned for reloading on the gravity conveyor, shown passing alongside the furnace.

Annealed and washed ring gears, after passing through the operation shown in Fig. 2, are hung on the pegs of the truck shown in Fig. 6. This truck is entirely of wood and the pegs are covered with lengths of rubber tubing. The gears cannot readily be damaged under this system of transportation.

It is not necessary to handle partly finished pieces so carefully. Fig. 7, for instance, shows how parts are

Fig. 5. Carbonizing pots which have just been loaded, are being moved on steel skids to the ovens in the background.

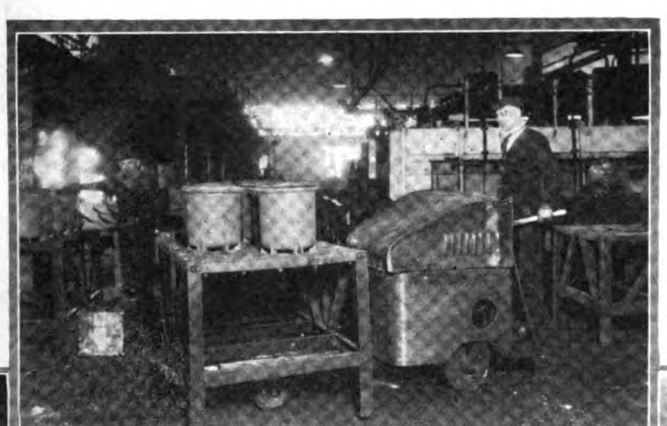


Fig. 6. Handling finished ring gears gently. Note the soft tires on the wheels, the all wood truck body and the pegs covered with rubber.

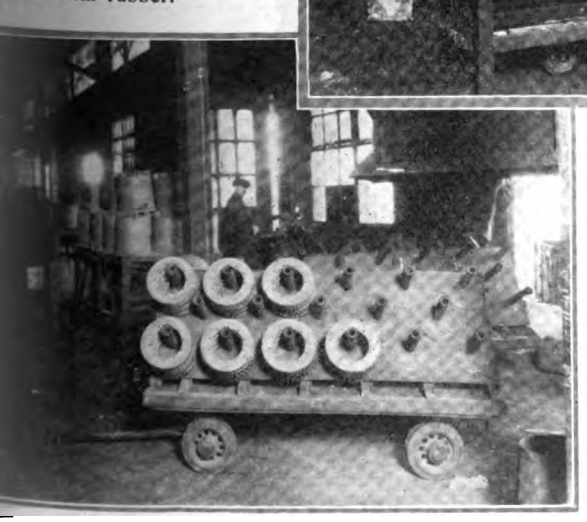
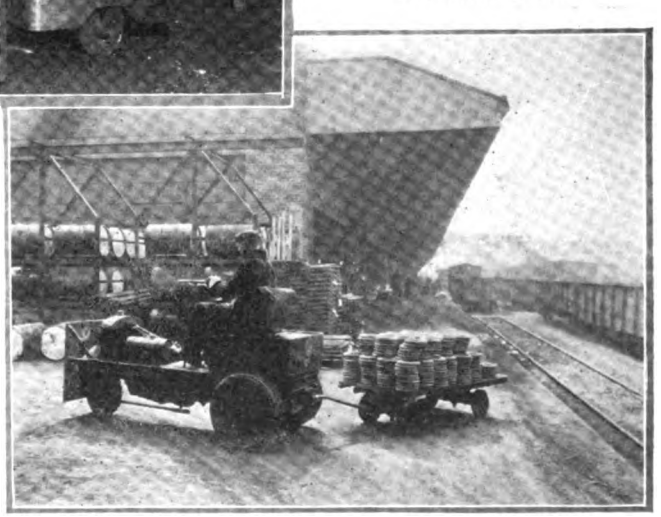


Fig. 7. Gasoline tractors and trailers are used to move semi-finished parts through the heat treatment plant.



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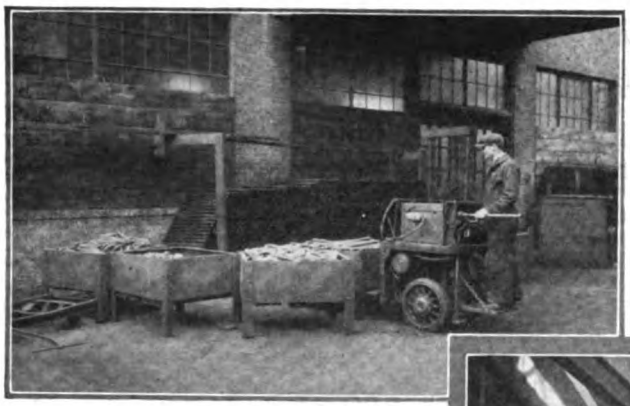


Fig. 8. Partly finished pieces in the skid boxes are handled by electric lift-truck.



Fig. 9. The hand lift-truck finds many applications in the heat treatment plant.

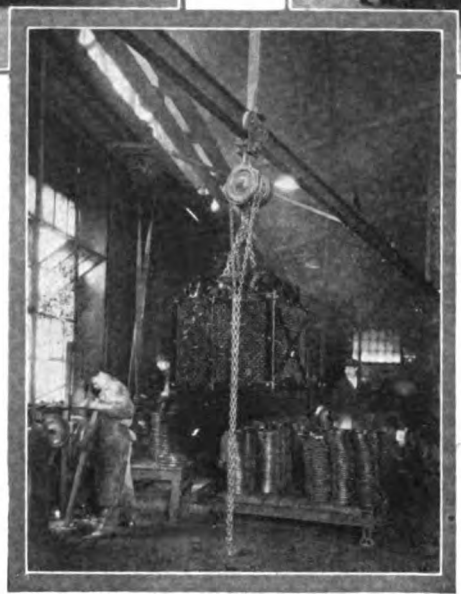


Fig. 10. How the ring gears are conveyed in metal baskets via trolley hoists, to the quenching tanks.

transported between the outside storage and the processing operations. In this case, an ordinary flat platform truck drawn by a gasoline tractor is used.

Two other methods of handling partly finished pieces through the heat treating department are shown in Figs. 8 and 9. In the one case an electric lift-truck is utilized and in the other a hand lift-truck. All the containers in this department are of steel since the pieces to be handled are still hot.

In Fig. 9, a side dump bucket mounted on wheels and filled with metal turnings, is shown passing through the doorway. It is drawn by a gasoline tractor and is being taken to the waste pile.

Fig. 10 shows several stages in the handling of ring gears. At the left the operator is grinding them, and as he does so, places them on the fixed bench beside him. Thence they are moved and placed on the truck skid in the center foreground. The steel and wire cage suspended in the air contains ring gears returning along the mono-rail hoist from the quenching tanks after annealing has been completed.

The oil for use in the different hardening and tempering operations varies in kind, according to the nature of the heat treatment. It is received in drums as shown in Fig. 12. These are lifted into place on the proper rack by means of tongs supported by a hand hoist.

Although it cannot be seen distinctly on the photograph, each compartment is labelled "Spirits," "Grease," etc., so that the barrels are readily identifiable. Incidentally, the skids upon which the drums rest, in the rack, are ordinary T-rails weighing about sixty-five lbs.

The handling of materials through heat-treatment operations presents unusual difficulties inherent in the processes. It is not easy to handle hot pieces in any case, but when they are as small and numerous as in this plant, the difficulties are multiplied.

It is not the least interesting feature of the handling methods just described that they not only solve the transportation problem in a large heat treatment plant, but actually play an important part in the processing itself.

Fig. 11. Skids loaded with the highly finished drive shafts which are awaiting transit to the annealing furnace.



Fig. 12. Drums of oil, grease and spirits are placed in labelled compartments in the stock racks.



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The Detroit Axle Plant

Summary of Operations

THE plant at which front and rear axles and the drive-shafts for all Chevrolet cars and trucks are made is divided into four distinct units.

1. The Front Axle Unit

The incoming material includes forgings for the axles and small parts which arrive by motor truck from the drop forge plant in Detroit; castings for the brake drums and rear wheel hubs; sheet steel for the disc wheels and bars for small parts.

The operations include the machining of all the front axle parts and the assembling of the complete axles. Brake drums and rear wheel hubs are also machined and dispatched to the assembly line in the rear axle unit. Disc steel wheels are manufactured complete except the felloe bands, which are purchased. These are sent to the main and district car assembly plants.

2. The Drive-Shaft Unit

The material received includes bars for the shafts themselves, gear blanks and other drop forgings, castings, such as those for the gear case, together with rods for the screw machine parts.

The operations include turning and grinding the shafts (which are heat-treated at another unit), machining castings, cutting all the rear axle gears, making small parts and assembling the complete drive shafts. These are then dispatched by a mono-rail conveyor to the rear axle unit, where they form part of the assembled rear axles.

The illustrations below give a graphic picture of the vast amount of parts handled through the Axle Units. Front axle forgings are piled at the left, rear axle stampings at the right, and finished rear axles in the center.

3. The Rear Axle Unit

The raw materials for the operations in this unit are: strip steel for the axle housings and brake parts, bars for the axles themselves and for rods and other small parts. All the brake parts are machined and brought together in a brake sub-assembly, ready for delivery to the rear axle assembly line. The sheet metal housings are stamped, formed and welded; the axles are turned, ground and hardened.

The final assembly is a bringing together of the three sub-assemblies: The axle and housing, brakes and drive-shaft, followed by the installation of the tie-rods and other small parts.

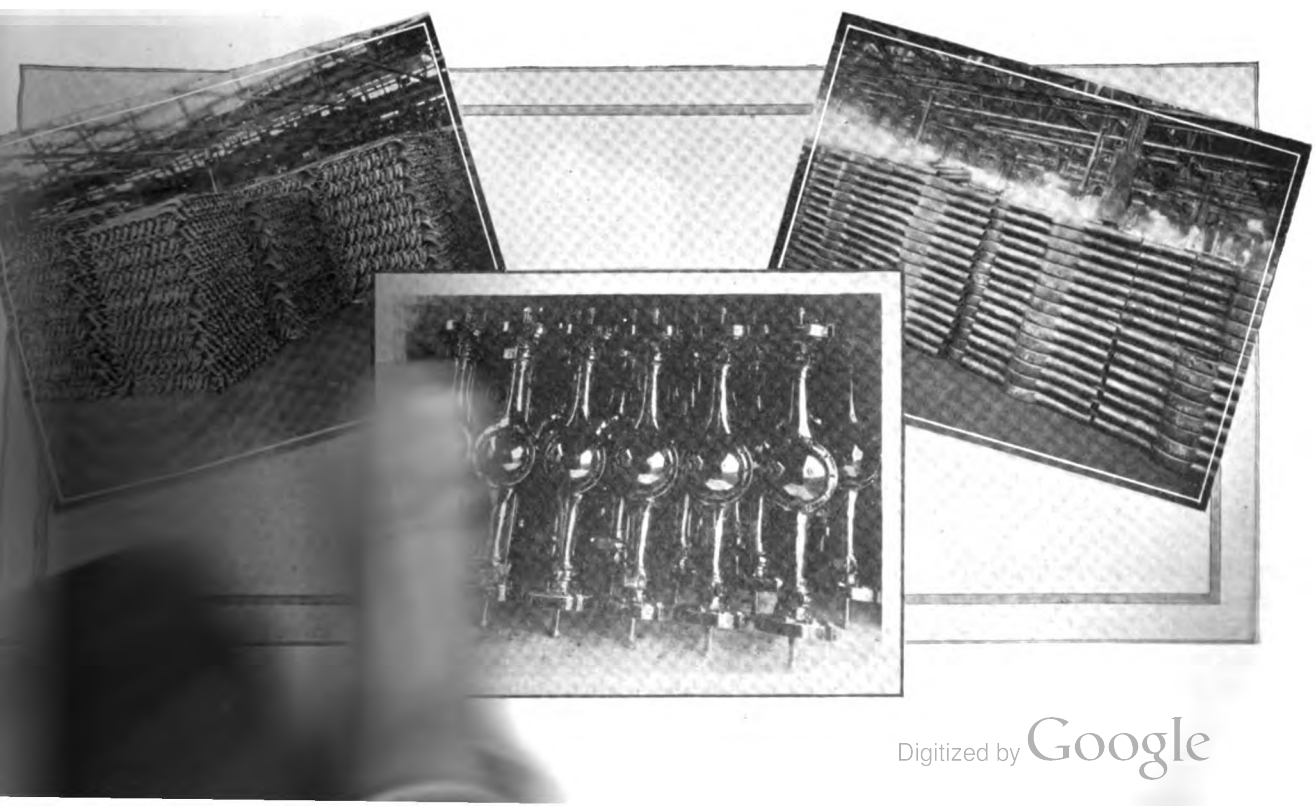
The final operations in these three units are washing, painting and drying, after which the axles are ready for shipment to the assembly plants.

4. The Heat Treatment Unit

This has already been described in a preceding section. It is devoted almost exclusively to the heat treatment of axle parts.

The methods of handling materials through the three axle units have certain elements in common. In each, there are castings and small parts to be handled in tote boxes and on box and platform skids and trailers. There are shafts to be processed in the same way and transported between operations by the same means. The final assembly, in each case, is made while the units are travelling upon conveyors.

However, there is sufficient difference between the several assemblies to require sufficient modification of the handling methods so that a separate discussion of each will be valuable.



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Gravity Is Put to Work in the Front Axle Plant

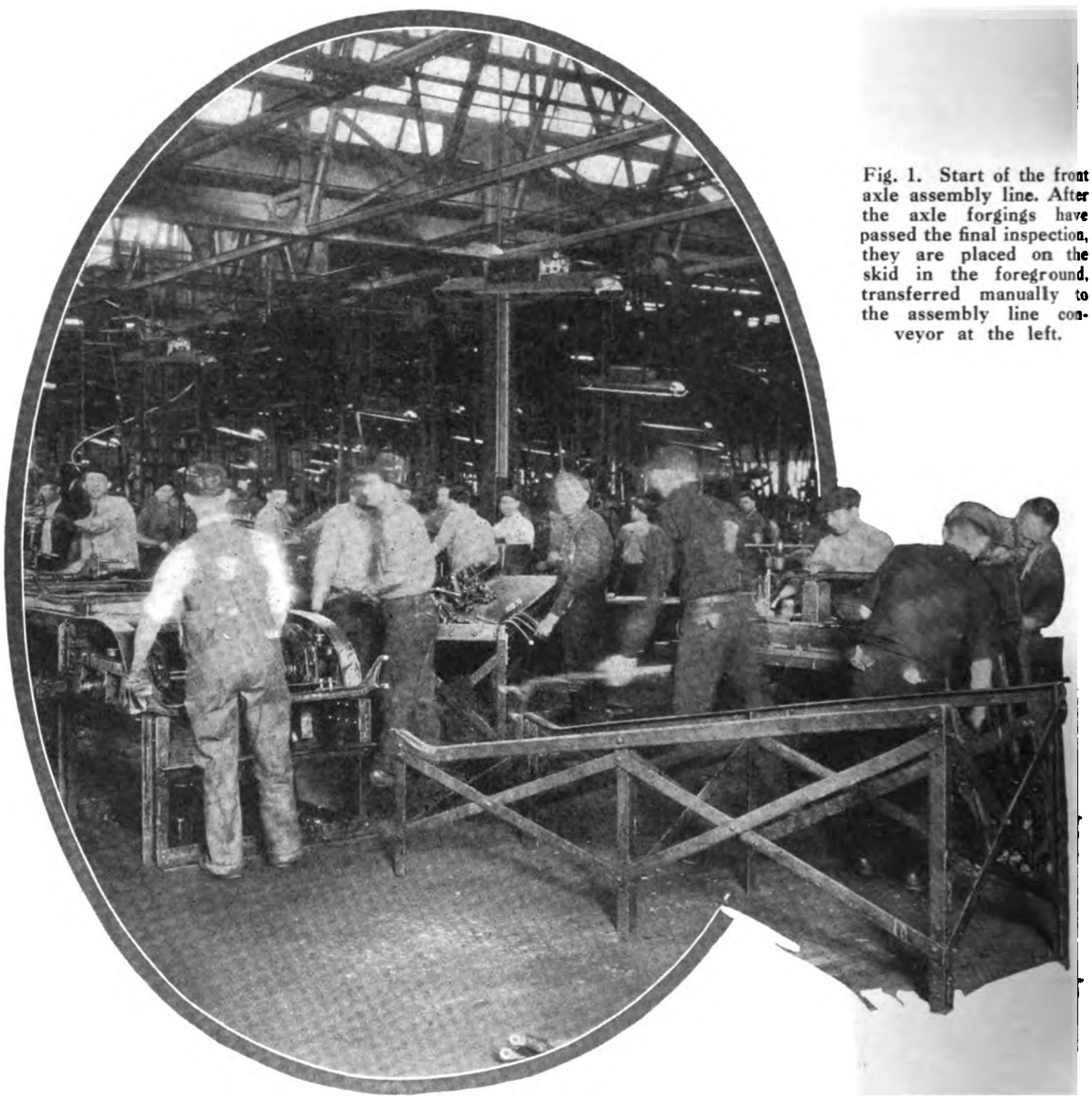


Fig. 1. Start of the front axle assembly line. After the axle forgings have passed the final inspection, they are placed on the skid in the foreground, transferred manually to the assembly line conveyor at the left.

FRONT axles, for all models of the Chevrolet car, are manufactured in Detroit. In the same plant, rear axles, gears, brake-drums, rear-wheel hubs and disc wheels (with the exception of the felloe bands) are manufactured in accordance with the same production schedule.

Front axle drop forgings come to this department from the drop forge plant, as previously described, on trucks. These forgings, together with other parts entering into the making of the front axle, are piled directly at the head of each of the production lines; the schedule being arranged to maintain not more than one week's supplies of parts on hand. *This applies not only to this unit but throughout.*

After inspection and straightening, the front axle forgings are placed on metal slides which are located at the head of each line of production machines. They a carried through machining operations in a similar ma ner, by gravity slides and manual transfer from one n chine to another. After machining, the axles rece final inspection and are placed (Fig. 1) on the assem conveyor, which is essentially a drag chain conve operating at a speed which permits assembling there 250 front axles per hour.

Shelves extend the full length of this conveyor l (Fig. 2) for holding the various parts entering into progressive assembly. At each operator's station, alo the assembly conveyor, are the tools necessary for particular part of the work; electrically or pneumatica operated tools being suspended overhead wherever th use will facilitate the work. The smaller parts wh enter into the front axle assembly are brought to

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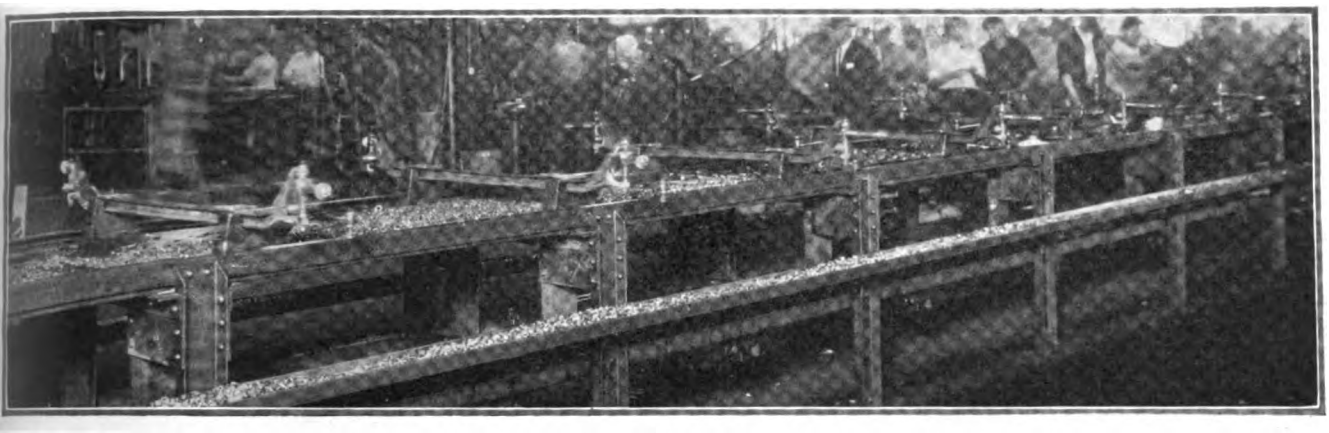


Fig. 2. Another view of the front axle assembly line conveyor showing the attachments for holding the axle forgings and boxes for small parts.

assembly line in metal tote-boxes, production lines for these smaller parts being so arranged that they reach the final assembly conveyor at the proper point for incorporation into the finished axle.

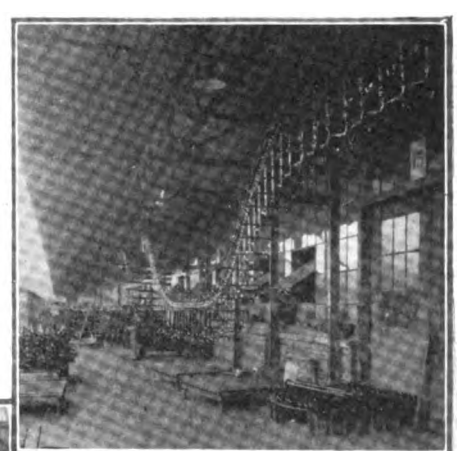
At the end of the assembly conveyor line the assembled axles pass to another slide similar to that shown in Fig. 1. From the lower end of this slide, after inspection, they are placed on hooks on an overhead mono-rail chain conveyor (Fig. 3), which carries them through washing, painting and drying operations, delivering them to the shipping platform. Here (Fig. 4) they are transferred to hand trucks which take them into freight-cars for delivery to the various district assembly plants.

In the manufacture of disc-wheels full advantage is taken of the circular shape of the parts; chutes or roll-ways (Fig. 5) being the principal means for transporting wheel discs from one power press to the next. A similar method (Fig. 6) is used in passing brake-drums from operation to operation. The rear wheel hubs which are made in this same manufacturing unit are handled in tote boxes and boxed-type lift-truck skids, a method which lends itself more readily to the handling of this part than would an elaborate conveyor system. The drive-shaft unit is described in the next article.



Fig. 3. Left: At this point the completely assembled front axle is removed from the assembly line power conveyor to an overhead mono-rail conveyor which carries them through the washing and painting operations to the shipping platform.

Fig. 4. Right: Overhead conveyor mentioned in Fig. 3 at the shipping platform. Here the axles are placed on hand trucks for movement into freight cars.



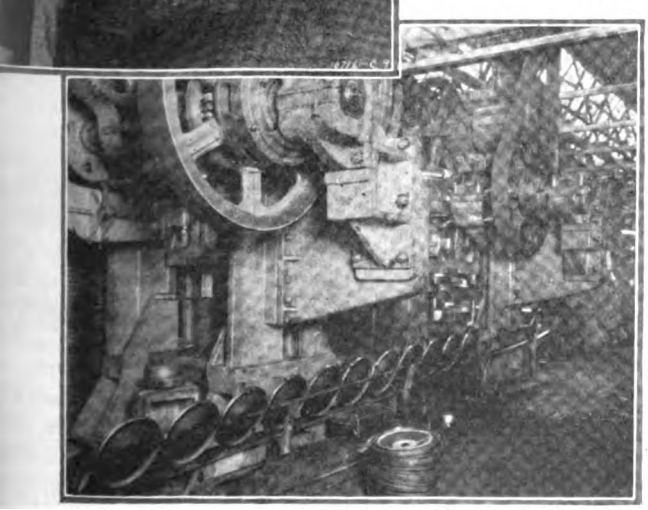


Fig. 5. Wheel parts are also manufactured in the front axle plant. A gravity conveyor carries wheel discs from one power press to another.

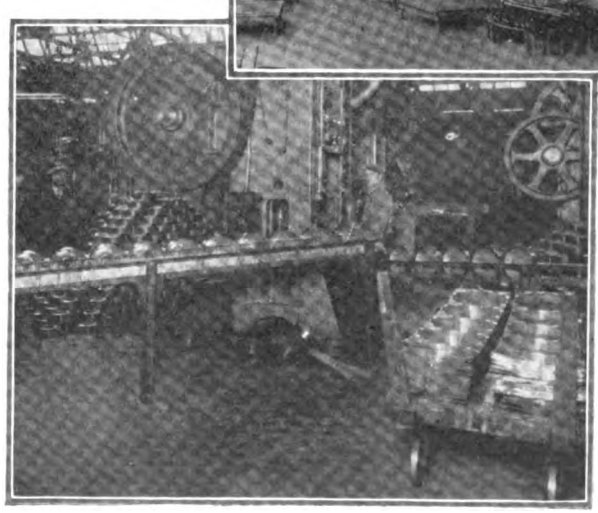


Fig. 6. Brake-drums are also handled on equipment similar to that shown in Fig. 5. These conveyors are simply runways or chutes down which the circular pieces roll by gravity.

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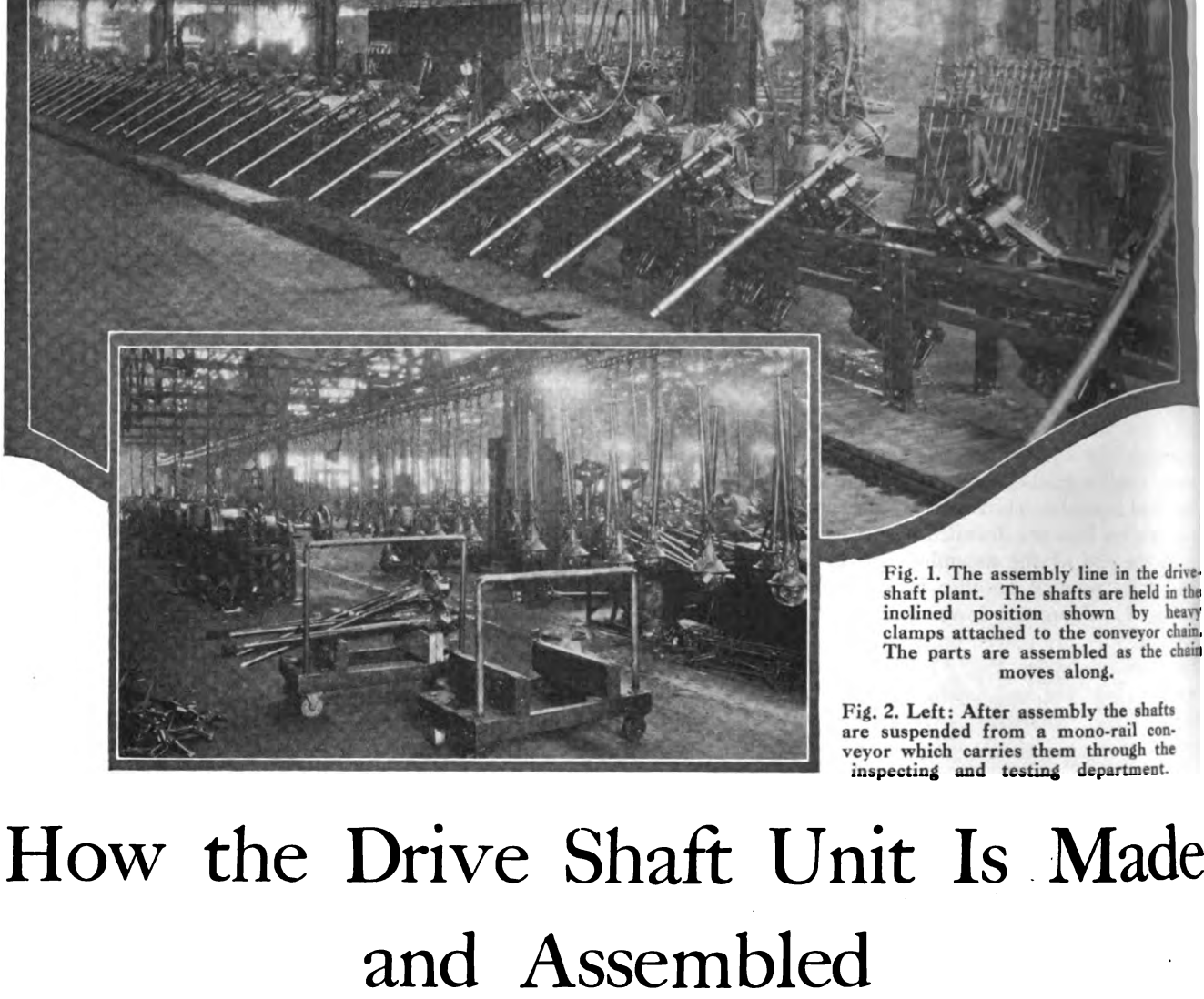


Fig. 1. The assembly line in the drive-shaft plant. The shafts are held in the inclined position shown by heavy clamps attached to the conveyor chain. The parts are assembled as the chain moves along.

Fig. 2. Left: After assembly the shafts are suspended from a mono-rail conveyor which carries them through the inspecting and testing department.

How the Drive Shaft Unit Is Made and Assembled

Trailer Trains Used Between Departments, Lift-Trucks Within Them and Conveyors for Heavy Work

THE second of the Detroit gear and axle units is devoted to the manufacture of the rear axle gears and of the drive-shaft and its parts. The latter is also assembled and tested in this unit.

As the drive-shafts are considered members of the rear axles, they are conveyed to the unit in which those parts are being made and assembled with them in the course of production. The manufacturing operations in the drive-shaft plant include turning, grinding and key-seating shafts, machining the gear cases, cutting the gears and making small parts on the automatic screw machines.

Conveyors are used to a considerable extent to transport material through the process. As in the other Chevrolet plants, the conveyors are extensively supplemented by lift-trucks and tractors. Box and open trucks of the wheel type and box and open skids are used as the nature of the handling dictates.

One of the principal uses [illegible]wer conveyors is to facilitate the assembling [illegible]shafts. One of these is shown in Fig. 1. It is a chain-conveyor wit heavy attachments in which the drive-shafts are clampe As they pass down the assembly line, each of the oper ators adds his contribution. The finished drive-shaft are suspended from hooks attached to a mono-rail power conveyor as shown in Fig. 2. The shafts in the illus tration have just left the testing department and are o their way to the distant rear axle assembly unit. Thi conveyor passes across the covered bridge shown in Fig 3, which has a length of 450 feet. The total length o the conveyor is 1,000 feet.

The system of handling castings as they arrive o the receiving platform from the Saginaw foundry i illustrated in Fig. 4. The track is spanned by three conveyors which elevate the castings from the loadin platform at the left and carry them across to the drive shaft plant at the right. These conveyors discharg into hoppers as shown in Fig. 5. The castings are the shot into box trucks by means of a distributing chute These trucks are of wood, substantially reinforced with

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Fig. 3. There is another section of the monorail conveyor shown in Fig. 2 inside the above housing. It connects the drive-shaft unit with the rear axle assembly unit.



Fig. 4. Incoming castings are received on the platform at the left and transferred to the manufacturing unit by continuous conveyors, three of which are shown in the illustration.

steel bars. They are fitted with dumping gates at one end. They have draw-bar connections so that they may be hooked together in a train to be drawn to the castings shed or to the machine shop by gasoline tractors.

Fig. 7 shows one of the benches upon which the rear axle gear sub-assembly takes place. One of the blocks on the table is a drill jig used in conjunction with the pneumatic drills shown suspended over the further end of the table. The castings feed into the sub-assembly by way of the lateral chutes, while the finished part leaves for the drive-shaft assembly line via truck. In passing, we may mention that there are 357 automatic gear cutting machines in this shop.

Those parts of the drive-shaft assembly which require heat treatment are sent to the adjoining heat treatment unit, as already described under that heading.

Portable pneumatic tools are used extensively along the assembly conveyor line for fitting. The method of suspension is of interest. The flexible hose is coupled to the compressed-air pipe drop. The weight of the tool is carried by a wire which passes over a pulley to a counter-



Fig. 5. This is the end of one of the conveyors shown in Fig. 4 inside the drive-shaft plant. The castings are discharged into the hopper and loaded into box trailers by means of the distributing chute.

Fig. 6. Below: The box trailers are here shown delivering castings to the machine groups, from the castings storage or direct from the conveyor shown in Fig. 5.



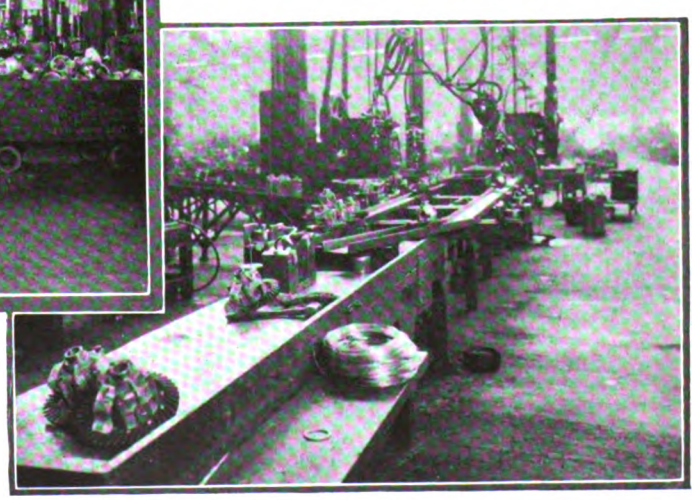


Fig. 7. Right: This is one of the benches upon which the drive-shaft gear units are assembled. From here they are taken to the assembly line.

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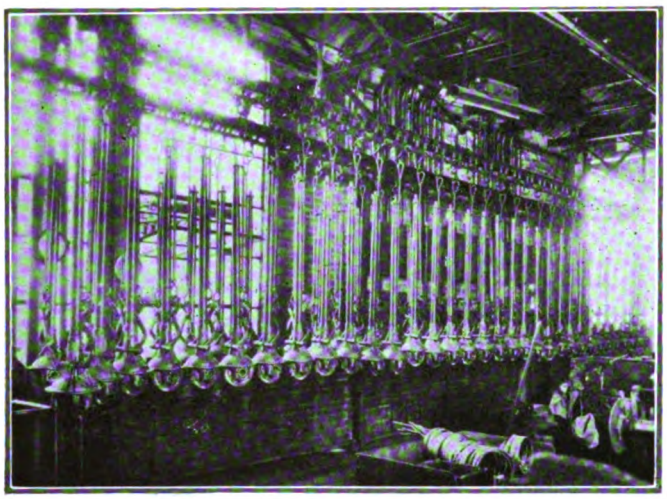


Fig. 8. This is another section of the mono-rail conveyor shown in Fig. 2. It carries the assembled shafts through the finishing operations and over a bridge to the rear axle assembly plant.



Fig. 9. Two methods of handling the ring gears through the machine shop. Platform trailers or skids are used.

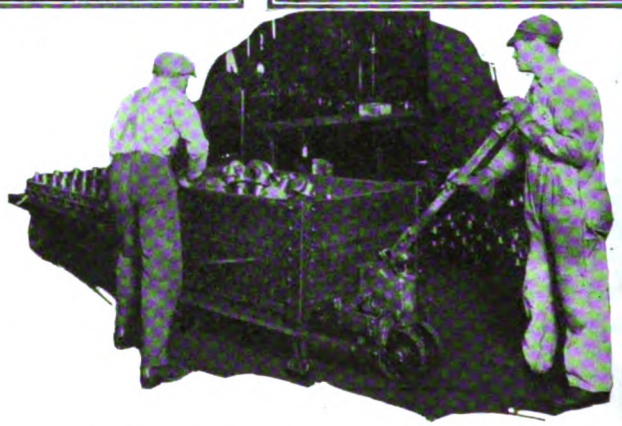


Fig. 10. Castings are also handled through the shop in box skids which are moved about by hand-operated lift-trucks.

weight. The air tools thus remain suspended in mid-air within reach of the operator and can be moved about with the least effort.

Tractor trains and trucks are used more universally in this plant than in the other major units. One reason for this is that, as castings enter so largely into the assembly which is being produced, box or platform trucks furnish the most convenient means of transportation.

As the distances are large and the loads not unduly heavy, it is more economical to hook the trucks together in a train and draw them to their destination by tractor.

Tractor trains are also used to remove the accumulation of borings and turnings to the scrap dock. This is a high platform reached by a ramp, level with the top of the sides of a gondola car. The side dump buckets containing the scrap are thus discharged directly into the cars spreading the load.

To return to the mono-rail conveyor shown in Fig. 8. After the shafts are suspended from the hooks of this conveyor by means of a suspension rod they pass through a final inspection department in which they are examined for possible defects. After this, they go through a washing operation to remove particles of metal adhering to any section of the drive-shaft assembly. When they are thoroughly cleaned and while still suspended from the conveyor, they pass through the paint spray booths and then through a drier. After final inspection they continue along the mono-rail, across the bridge, to the point at which they join the rear axle assembly line. One of the most notable features of the conveyor system in this unit is the long mono-rail across the yard, one of the longest ever built.

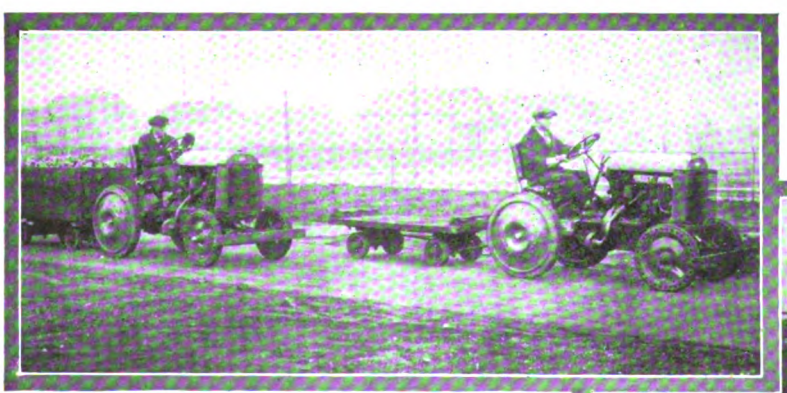


Fig. 11. Chevrolet-built gasoline tractors are used as general utility locomotive units.

Fig. 12. Here is one of the tractors delivering a train of bucket trailers to the scrap dock where they are discharged directly to the railroad car.



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Mechanical Handling Equipment Used in the Rear Axle Plant

How Each Type Is Adapted to the Work It Is to Do

IN the third unit of the Detroit plant known as the rear axle unit, the stampings for the axle housing, brake parts and other sheet metal products are fabricated. All rear axle parts are also manufactured here except the drive-shaft assembly, the brake-drums and the rear wheel hubs as already described. The brake assembly and the complete assembly of the rear axle unit which also includes the drive-shaft are carried out in this unit.

In general, there are three principal steps in the assembly of rear axles: (1) Assembling the axle housings, and axles; (2) Joining this assembly with that of the drive-shaft; (3) Adding the brake assembly and the remaining parts.

Sheet metal stock for the rear axle housings is brought from the receiving platform to the press-room by tractors and trailers. It is then placed on the floor beside the first process machines. For the most part the stamped sheets are passed from one press operation to the next, by hand. The two halves of the housing are then welded together and placed on the chain-conveyor shown in Fig. 2. Meanwhile the drive-shaft parts have been machined and heat treated where necessary. The brake assembly goes through the same process.

The housings and drive-shafts are assembled successively on two types of power conveyors. The first of these is shown in Figs. 1 and 4. The

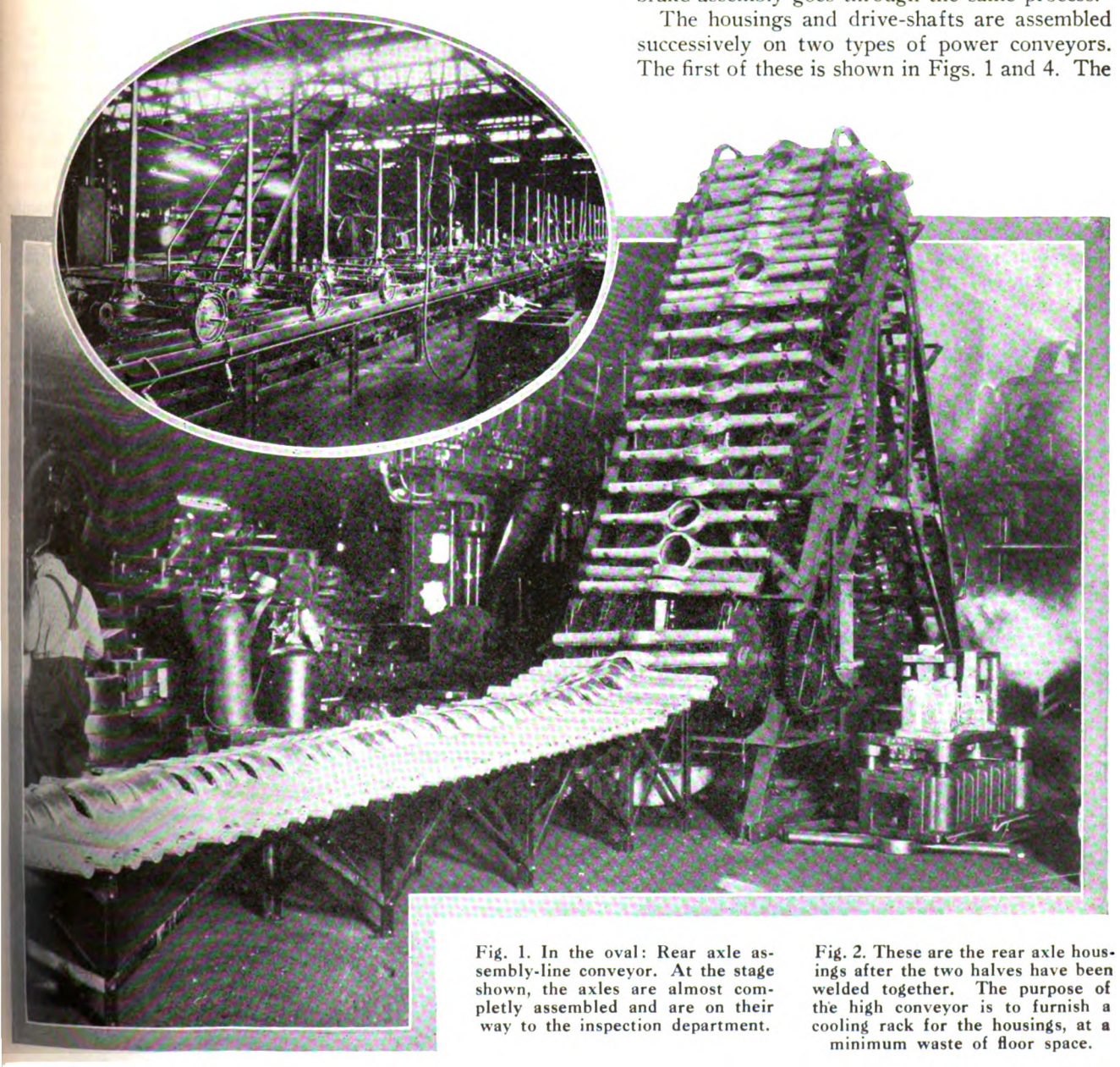


Fig. 1. In the oval: Rear axle assembly-line conveyor. At the stage shown, the axles are almost completly assembled and are on their way to the inspection department.

Fig. 2. These are the rear axle housings after the two halves have been welded together. The purpose of the high conveyor is to furnish a cooling rack for the housings, at a minimum waste of floor space.

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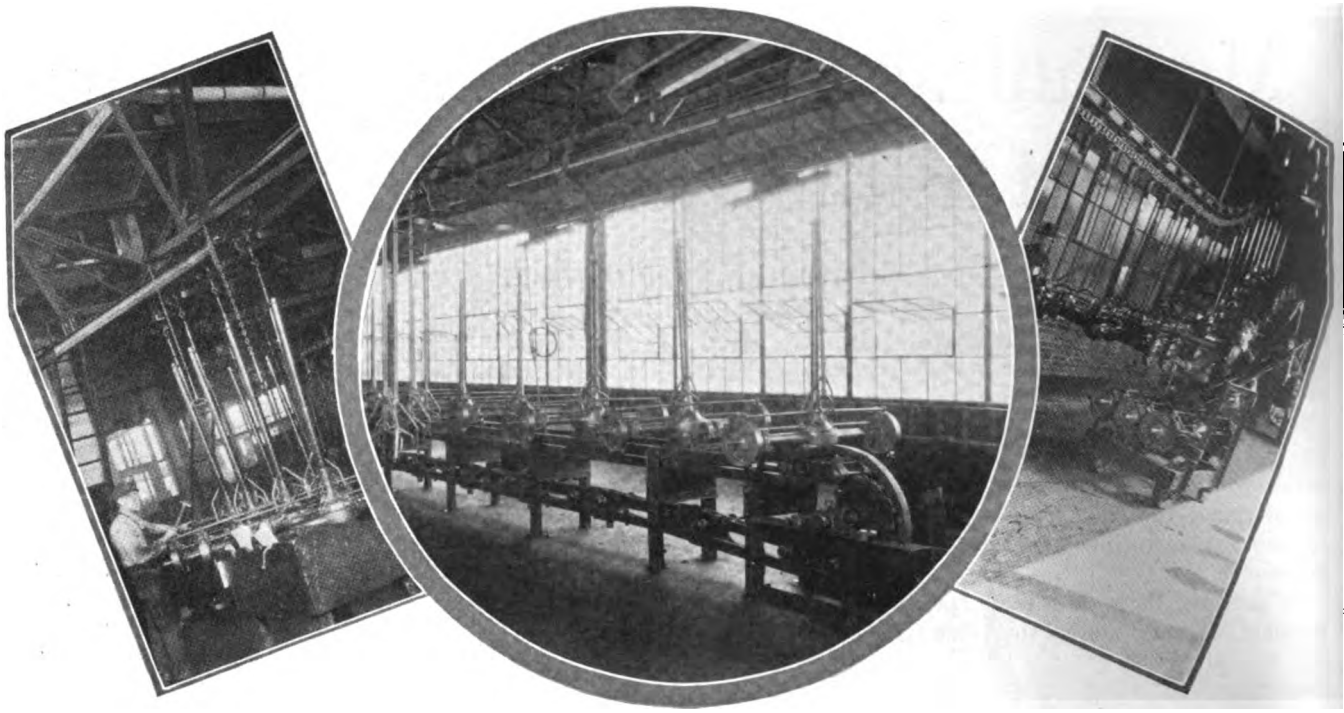


Fig. 3. Rejected axle assemblies sidetracked for repairs. They have been transferred from the assembly line conveyor on the right.

Fig. 4. This is the end of the axle assembly line. At this point, the axles are transferred from the chain conveyor to an overhead monorail conveyor system, for washing, painting and drying.

Fig. 5. The mono-rail conveyor carries the rear axles through the final operations and to the shipping platform where they are unloaded and placed on the steel rack cars for transfer to the railroad cars.

axles and housings are supported on heavy fittings attached to a chain. As they move along, the drive-shaft assembly is bolted in place. Then the brake assemblies are mounted on the axles and the stay rods assembled.

At the end of the assembly line, the completed rear axle units are transferred at the point shown in Fig. 4 to a mono-rail chain conveyor from which they are suspended by heavy hanger yokes. They are then inspected and the rejected assemblies side-tracked for repairs as in Fig. 3. Those which are accepted continue along the mono-rail to the washing station for a thorough cleaning. After this, they go through the paint booths and the driers, finally arriving at the shipping platform.

Box type trailers such as that shown in Fig. 6 are used not only for the transport of stripped steel, but also of small castings between the stock bins and the machine rooms. The illustration shows the end door of the truck in its raised position. The dies in the press department are handled between the storage racks and presses by power lift-trucks, as in the drop forge plant.

The method of handling scrap metal is peculiar to this unit. Small four wheel metal box trucks are placed under the machines to receive the borings, turnings or cuttings. They are brought to the side dump bucket station and emptied into the trailer body by means of a pneumatic hoist. The trailers go to the loading platform and deposit their loads. The scrap pile is transferred to the cars by electro-magnet.

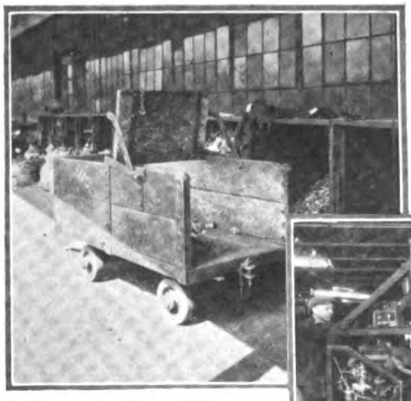


Fig. 6. Left: Wood box trailers are used for moving strip steel and castings from the receiving platform to the machine room. They are hauled by gasoline tractors.

Fig. 7. Below: How scrap metal is handled. Small box trucks are placed under the machines. They are dumped into the side bucket trailers by pneumatic hoists.



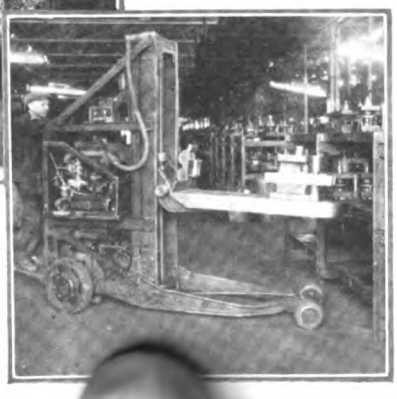


Fig. 8. Right: The heavy press dies are handled between the shelves and the stamping department by electric lift-trucks.

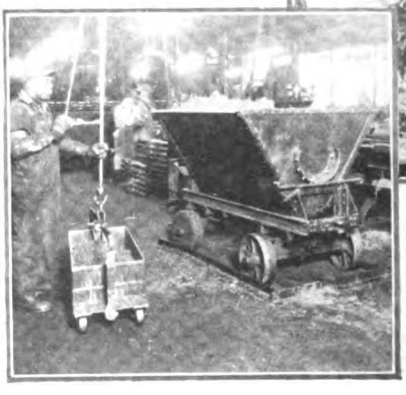
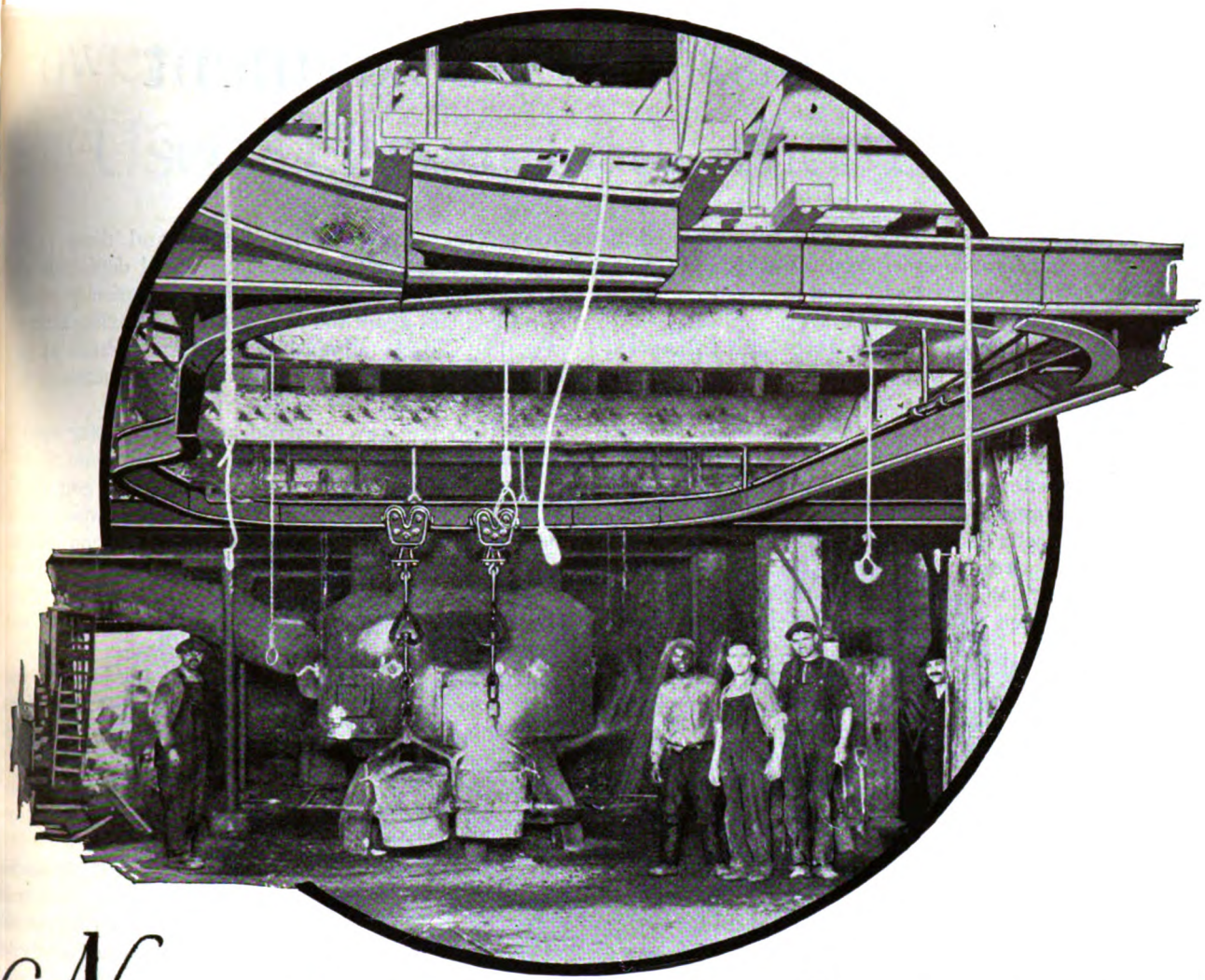


Fig. 9. Above: The scrap is loaded from the piles into gondola cars by the electro - magnets, controlled by the crane operators.

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No maintenance in 8 years' use-

"In 8 years' use the R-W equipment has required no maintenance except occasional greasing of the switches and removing foundry dust from the runways."

J. L. Wallace, Vice-President Indianapolis Castings Co., says:

"For 8 years we have obtained more efficient and economical material handling by using Richards-Wilcox OveR-Way track construction throughout our foundry, where we make grey iron and semi-steel castings for both the automobile industry and general use.

"At present we have approximately 3000 ft. of R-W track construction. The track is of 8 in. I-beam construction, with 2-way and 3-way switches and crossovers.

"The R-W track is used to convey molten metal from cupola to moulding floor for casting; the metal is handled in 1000 lb. bull shanks, from which it is transferred to moulders' ladles for pouring. Finished castings are also conveyed from the moulding floor to the rattling room each night. Another system of R-W tracks carries all 'sprues' or returns back to the cupolas from the rattling room.

"Before installing R-W OveR-Way track construction, we conveyed materials on tracks laid in the floor, which required much more manual handling. Common laborers now do much work that was formerly done by skilled moulders; and with moulders' time rated at $8 to $10 a day, the saving in handling cost is considerable.

"In 8 years' use the R-W equipment has required no maintenance except occasional greasing of the switches and removing foundry dust from the runways."

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Transmission Department

Summary of Operations

AN entire plant at Toledo, Ohio, is devoted to the production of assembled transmissions. Raw material is received as follows:

(a) Shafting in the form of bars.

(b) Gear blanks from the drop forge unit in Detroit.

(c) Castings for the transmission housing and covers from the General Motors foundry, at Saginaw.

The shafts are sheared from the bars and are then machined, heat-treated and polished. This requires a heat treatment department, very much like that described in the preceding article. The equipment and the handling methods in this department are quite similar to those already mentioned. Hence it will not be described, with the exception of one unique type of conveyor illustrated and discussed in the succeeding pages.

The gear blanks are machined and pass on to the transmission assembly. Castings also pass through the usual drilling and babbitting operations and proceed to the assembly benches.

The operations are therefore of such nature that the machinery and equipment can be arranged in groups for unit production rather than along the lines of progressive production, except in the case of the assembling department. Here the work is done on long benches. Each operator assembles or adjusts a part of the transmission and passes the unit in process to the next workman.

After the final assembly operation has been completed, the finished unit is taken to the test room. After all adjustments have been made, the transmissions pass through the paint spraying booths and thence to the shipping room for crating. Their final destinations are the central and the district automobile assembly plants.

In this plant again the unit system of machine arrangement lends itself admirably to the application of mechanical conveyors for transporting the materials between the manufacturing departments.

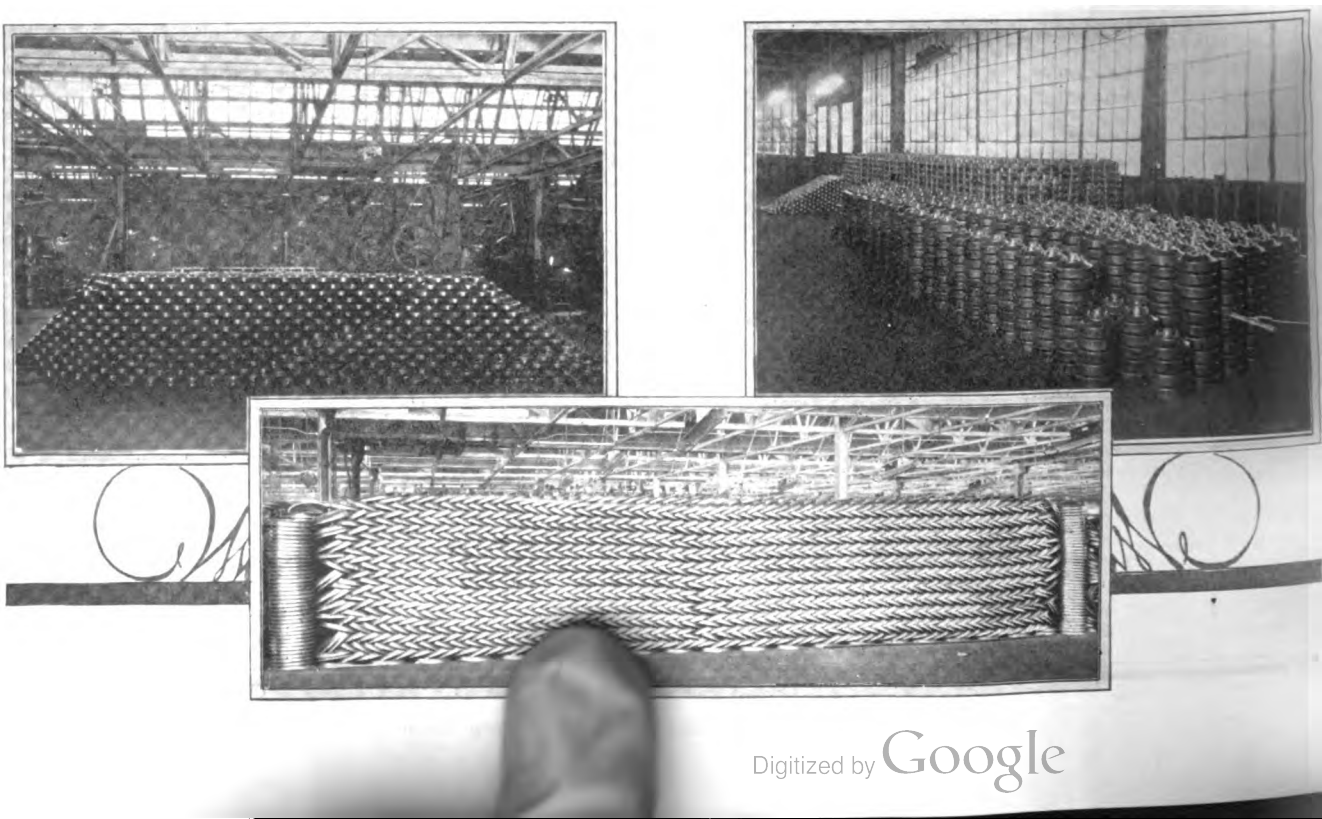
The incoming raw material and the outgoing finished product are also handled mechanically by means of conveyors of special designs. For example, the gear blanks are unloaded from the cars, by a conveyor which passes entirely over one department of the plant and delivers each size and kind of blank into the proper bins. These are located in the heat treatment department so that the gear blanks may be taken from them as required and passed through the heat treating processes.

In the same way, the castings for the housings and their cover plates, which must be inspected for defects after unloading into storage bins, are handled by mechanical conveyors from that point on.

Shafts are also conveyed mechanically from the cutting shears to a group of machines on the second floor, where processing starts.

When completed transmission parts are to be loaded on the cars from the shipping room, they are placed on a conveyor illustrated hereinafter which runs the entire length of the loading platform, within the building walls. By using a special form of drop in the conveyor itself, the transmissions are brought down within reach of the workmen who load them on the cars as well as of the groups of inspectors and checkers.

Quantity Production



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Power Driven Conveyors Extensively Used Throughout the Transmission Plant

Group Arrangement of Machines Lends Itself to This Form of Materials Handling

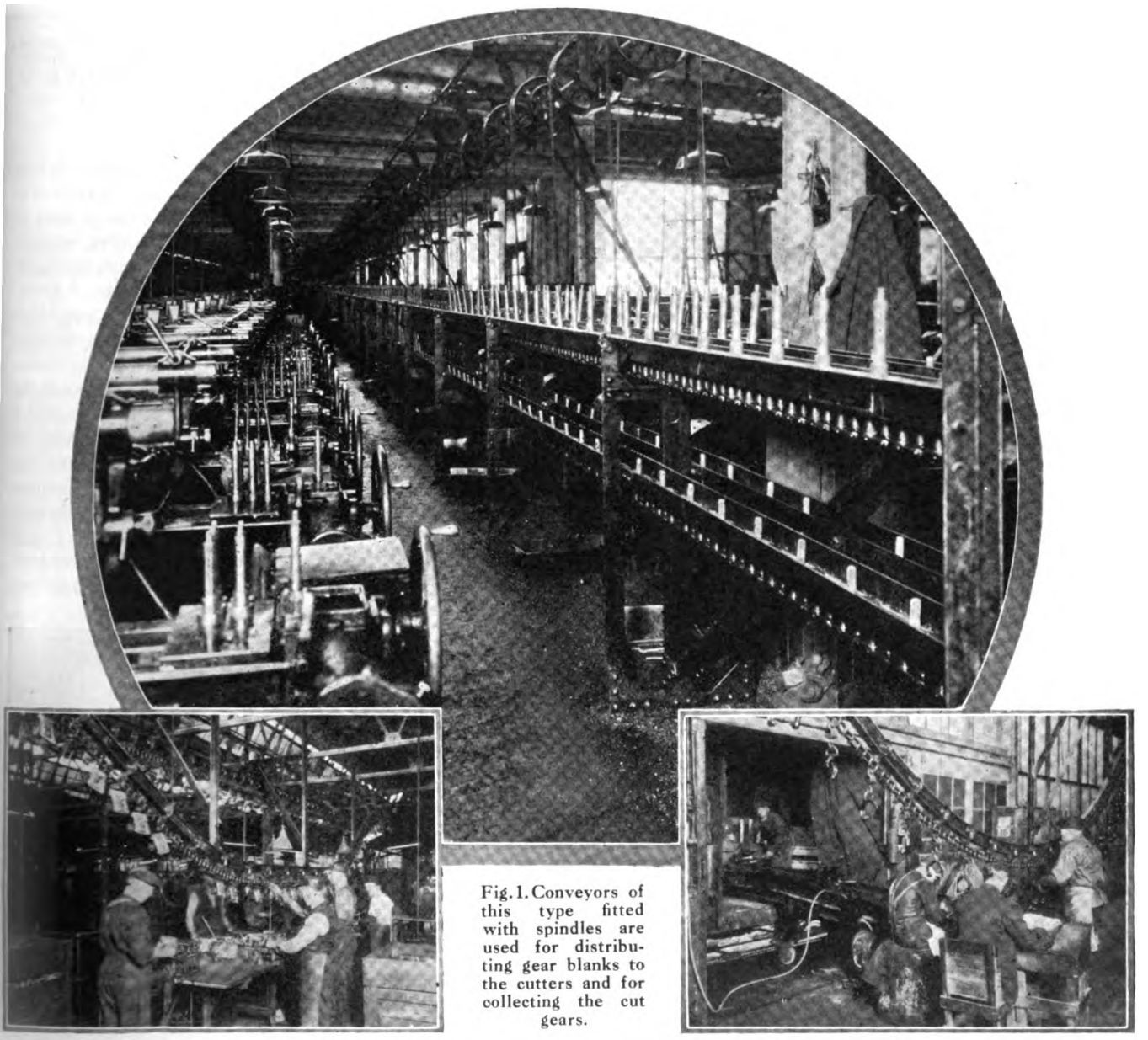


Fig. 1. Conveyors of this type fitted with spindles are used for distributing gear blanks to the cutters and for collecting the cut gears.

Fig. 2. Transmission case covers are hung on hooks attached to mono-rail conveyors for transportation between operations.

Fig. 3. The shipping room conveyor from which finished transmissions are suspended by special tongs and brought for delivery to the loading doors.

As an example of the application of continuous power-driven conveyors to a department in which there is a large number of processing machines, the illustration at the head of this page is interesting. The machines at the left form a battery of gear cutters. The problem of distribution of uncut or partly finished blanks to machines and of removing cut gears is solved by means of the double-decked conveyor shown.

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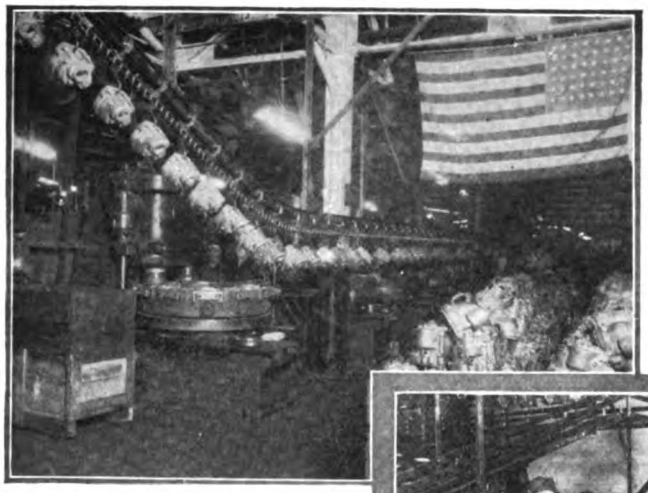


Fig. 4. The mono-rail type of suspension conveyor brings transmission housings from the store room to the machines.

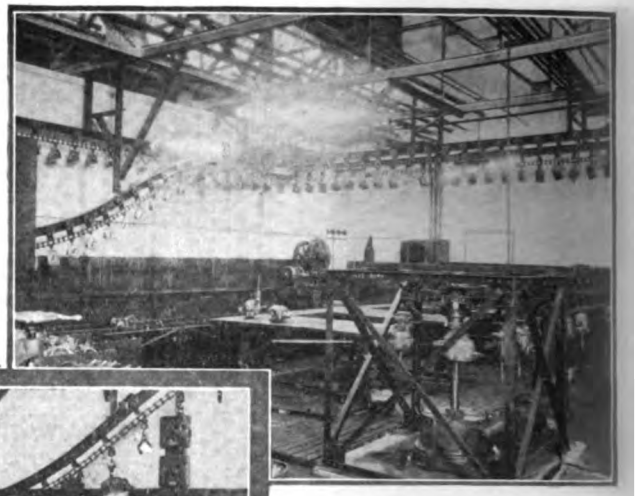


Fig. 5. A corner of the testing room. The overhead conveyor carries finished castings to the assembly lines.

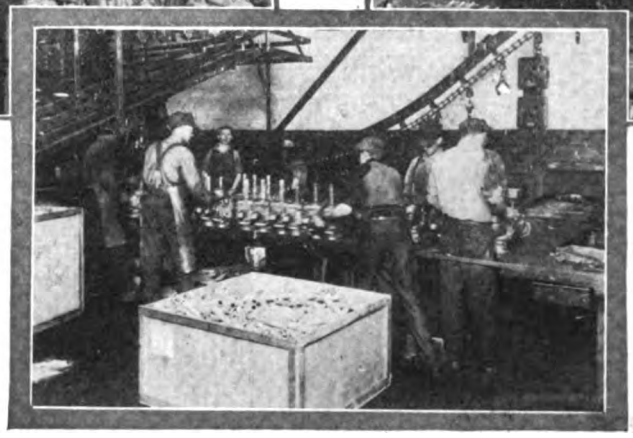


Fig. 6. Finished transmissions arrive by slat conveyor at this inspection bench, where they are placed on the monorail conveyor in the background for delivery to the shipping room.

In reality, the unit consists of two separate conveyors supported by the same framework. The two sides of the conveyor chain are in a horizontal plane, i. e., the conveyor sprockets are placed horizontally.

Upon the links of the conveyor chains are mounted the spindles shown in the illustration. The gear blanks to be cut are placed on the spindles of one conveyor and the cut gears on those of the other. Both chains travel in the same direction and at the same speed.

At some points in the production line, one conveyor (that which carries the gear blanks) is also used to transport partly finished gears from one operation to the next. Fig. 2 illustrates one of the conveyors which brings in the cover-plate castings from the casting storage bins and delivers them, by means of a drop, to the work benches, where the first operations are performed. The same system is used to bring in and deliver housings to the first process machines.

Incidentally, Fig. 3 shows a drop in the conveyor which delivers finished transmission to any of the loading doors. After the clerks shown in the picture have recorded the serial numbers of the transmissions and their destinations, the cases are placed on a portable belt conveyor, which carries them into the car. This conveyor is fitted with an automatic counting device, which totals the number of cases loaded on each car.

After the transmission housings and covers have been processed, they are hung upon an overhead conveyor which carries them to the as-

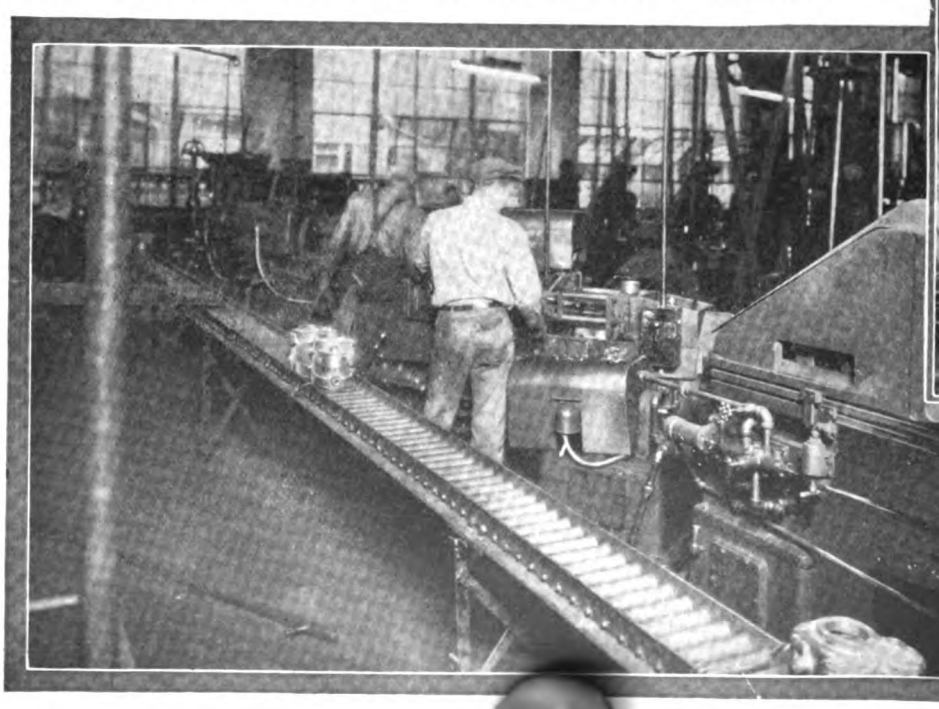




Fig. 8. Above: This is the mechanism for elevating sheared lengths of shafting to the floor above, where the first operation takes place.

Fig. 7. Left: Transmission castings pass from one department to another by means of gravity conveyors when the relative location of the departments permits it.

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Fig. 9. This is another view of the gear blank conveyor shown in Fig. 1. By the use of special fittings, the same type is used to move shafts and spindles.



Fig. 10. Box skid are employed to deliver castings to the assembly department. Note the slide on the work bench by means of which the parts are passed progressively from one man to the next.

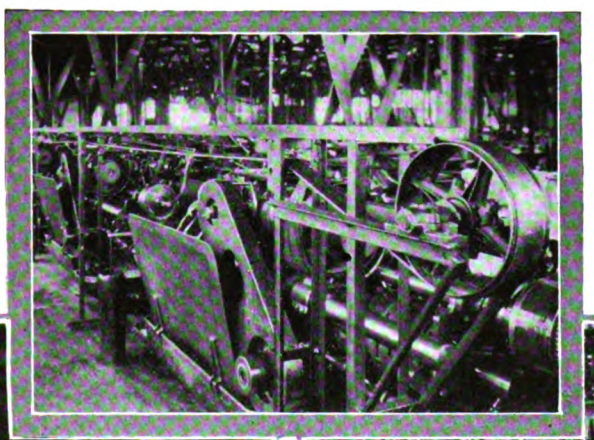
sembly room. This is shown in Fig. 5. At the center of this view there is another conveyor. Its purpose is to carry finished transmissions to the testing room.

After testing, the finished transmissions are placed on slat conveyors, which bring them to the station shown in Fig. 6, where they are inspected and hung on the chain conveyor, in the background. This carries them into the shipping room, being, in fact, a section of the same conveyor illustrated in Fig. 3.

At some stages in the process, gravity conveyors, such as that which appears in Fig. 7, are used to transport transmission castings between operations.

After the shafts and spindles have been cut by the shears at the left of Fig. 8, they are placed on a chute down which they roll to a slat conveyor which elevates them to the second floor. Then they pass through the first few operations. When they are completed, the partly finished shafts are carried on a belt conveyor shown in Fig. 11 through an inspection. They finally pass through the remaining machine operations on conveyors somewhat similar to that shown in Fig. 1, another view of which is shown in Fig. 9.

Fig. 11. A belt type of conveyor in the shaft department. Its purpose is to pass the shafts and spindles through a series of inspection operations.



After the shafts have reached the heat treatment department, the operations and handling methods are about the same as those described in a previous article. There is one type of conveyor in the heat treatment department at Toledo, which is not to be found in the one at Detroit. This is the slat conveyor illustrated in Fig. 12. It is designed to carry the parts from a quenching vat to the next operation.

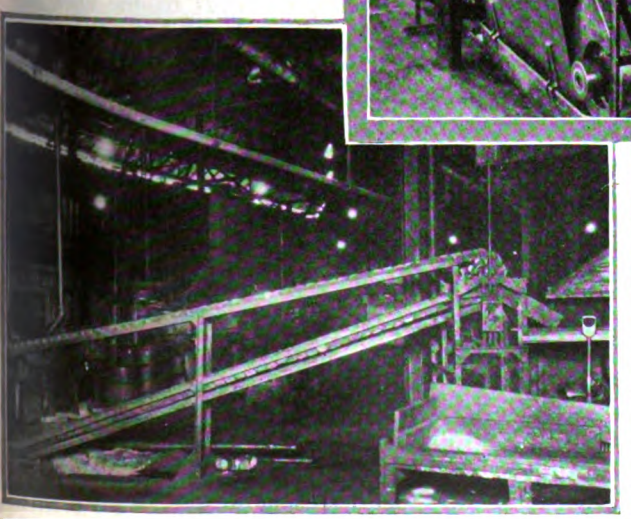


Fig. 12. This is a corner of the heat treatment department, where gear blanks and shafts are hardened or annealed, as the case may be. The slat conveyor carries the parts from a quenching tank to the next heat treatment operation.

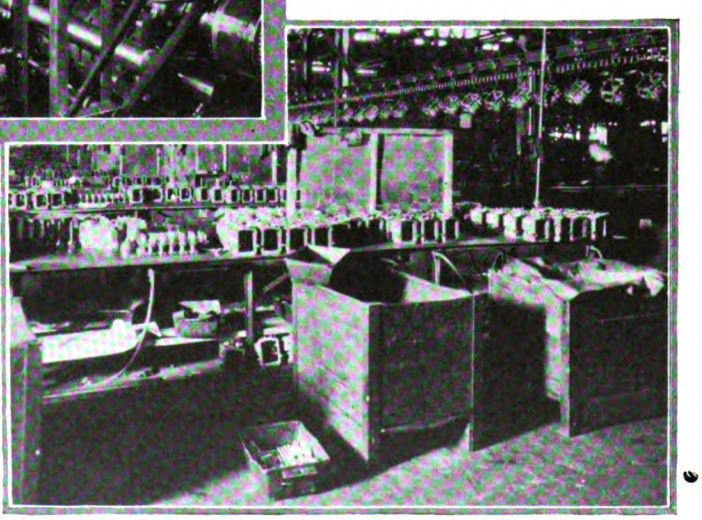
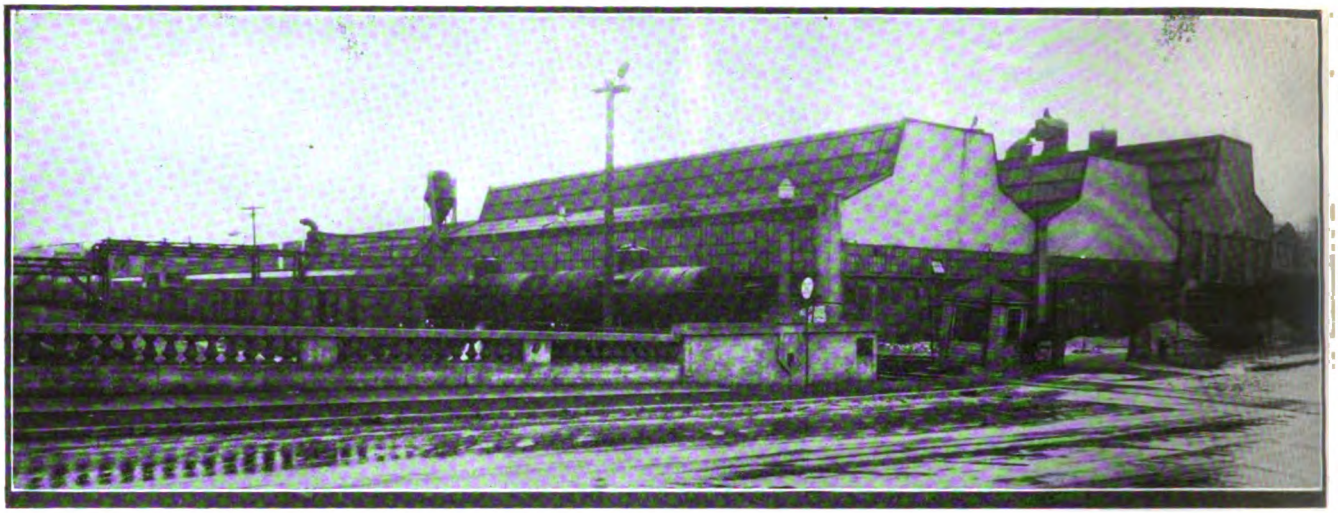


Fig. 13. The assembly department is practically the only one in which lift-trucks are employed in this plant. Castings are moved between operations in the boxes. The mono-rail conveyor which carries machine castings to the assembly room is shown at the upper right.

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Exterior view of the Flint Motor Assembly Unit shown in plan at the bottom of the page. The cylinder and cam-shaft unit is on the opposite side of the street, Chevrolet Avenue.

The Motor Parts and Assembly Plant

Summary of Operations

THIS is one of the largest Chevrolet production plants. It includes two units, the buildings shown above and, in plan, below; and the cylinder and cam-shaft unit on the opposite side of Chevrolet Avenue. Paved streets and a tunnel conveyor connect the two.

Incoming materials include: (a) Castings for cylinders, heads, pistons, crank-cases and flywheels, from the General Motors' foundry at Saginaw, (b) Drop forgings for crank-shafts and gear blanks from the drop forging unit in Detroit, (c) Small parts from Bay City, (d) Bar stock for cam-shafts and (e) Motor accessories.

1. Cylinder blocks are unloaded from the cars and taken direct to the head of the production lines in the cylinder and cam-shaft unit. After inspection, they pass through the rest of the boring, grinding and drilling operations on roller conveyors, leaving for the assembly unit, across the street, via tunnel conveyor.

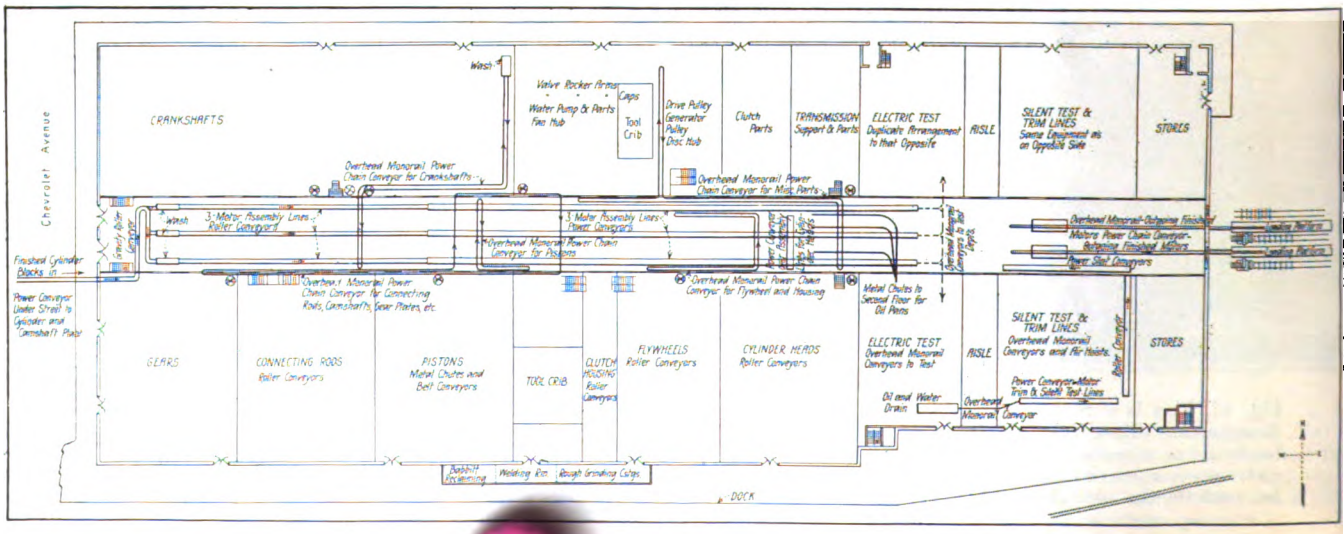
2. Cam-shaft stock is received in the form of bars, which are cut, turned, ground, annealed, hardened, inspected and dispatched to the assembly unit.

In the assembly unit, the following motor parts are machined in rooms on either side of the three assembly lines which traverse the building from end to end.

3. Crank-shafts. 4. Timing gears. 5. Connecting rods. 6. Pistons. 7. Valve rocker arms and caps. 8. Water pumps. 9. Pulleys. 10. Clutch housing. 11. Fly wheel. 12. Clutch. 13. Transmission supports. 14. Cylinder heads.

The cylinder blocks and cam-shafts enter the assembly line at the end nearest the unit in which they are produced. As they travel down the line on roller conveyors, the parts just named feed into the line at the proper points and are assembled. Boxes of small parts are in convenient positions along the assembly lines. Oil pans come from the second floor of the unit.

When the motors reach the ends of the lines, they are conveyed to the test room and tested under their own power. They then pass to the final inspection department, to be disassembled, inspected and reassembled.



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Straight-Line Production of Motors Gives Conveyors Their Opportunity

Lift-Trucks Are the Intermediate Means of Transport

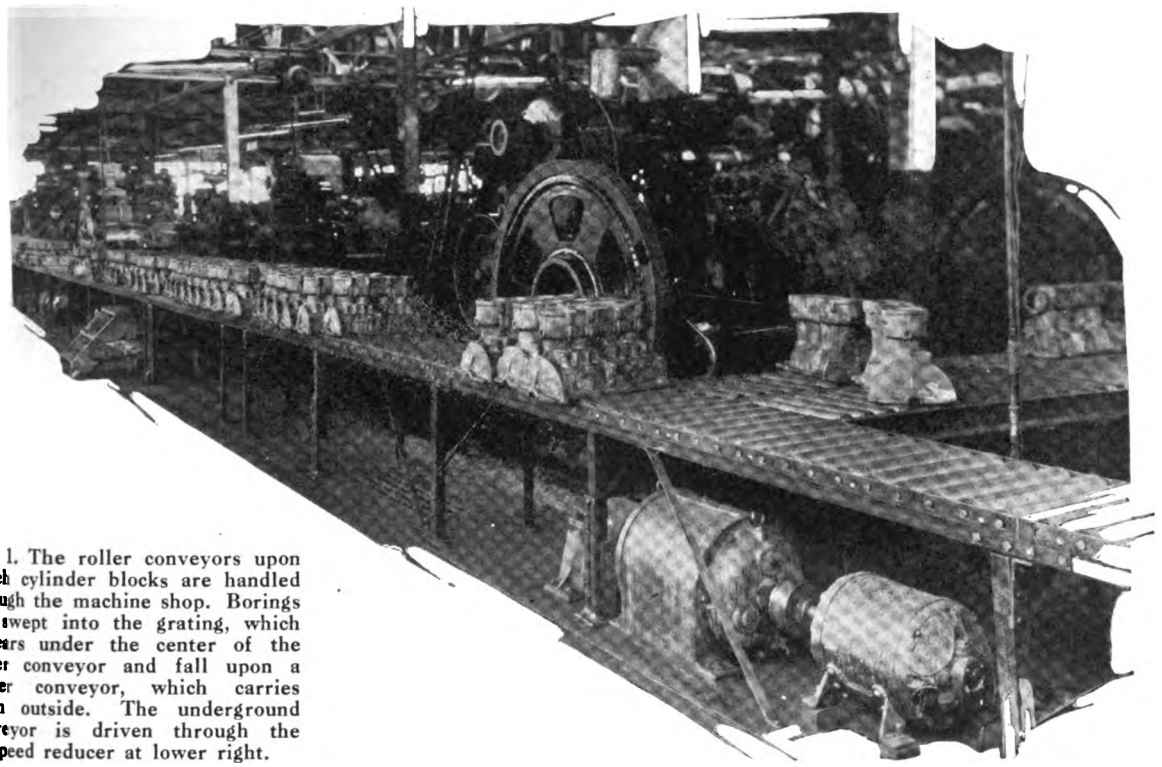


Fig. 1. The roller conveyors upon which cylinder blocks are handled through the machine shop. Borings are swept into the grating, which appears under the center of the roller conveyor and fall upon a power conveyor, which carries them outside. The underground conveyor is driven through the speed reducer at lower right.

THE cylinder and cam-shaft unit is in a rectangular building about 240 feet wide and 460 feet long divided into two sections, one for the manufacturer of each of the two principal products of the unit. The cylinder castings, arriving by rail from the General Motors foundries at Saginaw, are unloaded from the cars and placed directly on a power-driven monorail chain-conveyor as shown in Fig. 2. It runs throughout the length of the receiving platform inside the wall of the building. Castings are suspended from chain by long offset hook rods, at the bottom of which is a casting with two cone-shaped upstanding projections which engage two of the cylinders of the motor-block.

The conveyor delivers the castings to the head of the production line at which point the operator (Fig. 2) is unloading one of them.

The first operation is an inspection for defects and flaws. Accepted castings are then loaded on the roller conveyor shown in Fig. 1, for delivery to each of the several rows of machine tools. Roller conveyors are used throughout the cylinder department for conveying the blocks from one operation to the next. One of them may be seen at the left in Fig. 2 and two of them at the right in Fig. 1.



Fig. 2. Right: The incoming cylinder blocks are delivered to the machine shop from the receiving platform by a chain conveyor. They are sent out to the machine tools on roller conveyors as at the left.

While the cylinders are not unusually heavy pieces to handle by power conveyors, they are too bulky to be handled, in large quantities, by truck. The roller conveyor, therefore, has proven to be the most satisfactory method of moving the blocks.

Then, too, the special machinery for boring and grinding the cylinders, for multiple drilling, tapping and other finishing operations are so designed for rapid production as to require a continuous delivery of motor blocks to and between them. Another advantage of the roller conveyor is that its height is approximately the same as that of the machine table, so that all lifting is dispensed with.

The system of cross conveyors,

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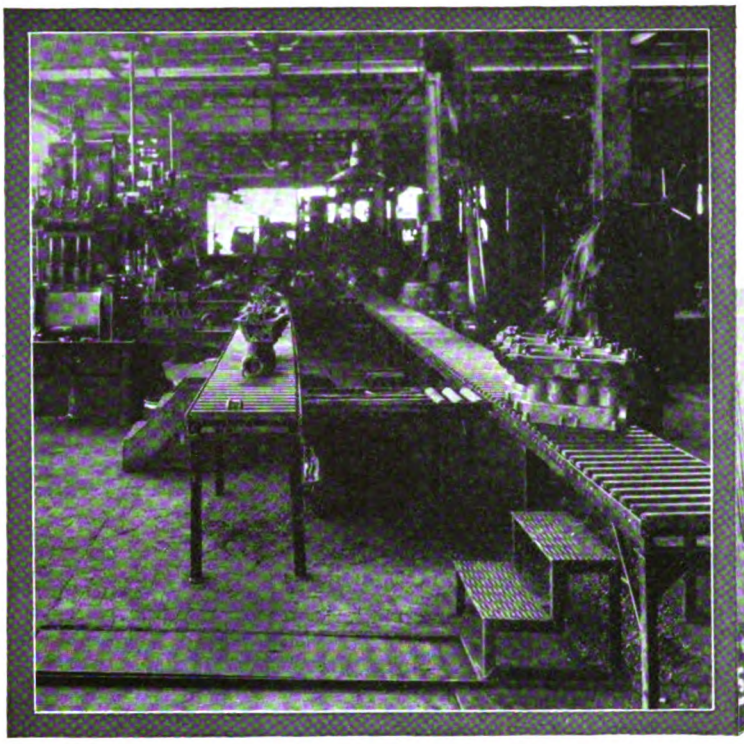


Fig. 3. Left: These completely machined cylinder blocks are on their way, by roller conveyor, to the point of dispatch to the motor assembly building, as shown below.

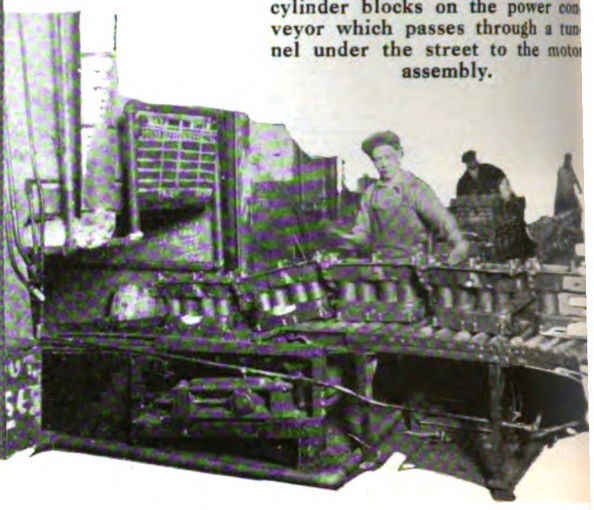


Fig. 4. This is the terminal point of the roller conveyors shown in the illustration to the left. The operator is placing the machined cylinder blocks on the power conveyor which passes through a tunnel under the street to the motor assembly.

which affords storage room for blocks not wanted on the main conveyor, is shown in Fig. 3. After the completion of all machine operations, the cylinder blocks pass down a final roller conveyor which delivers them to a power driven belt conveyor, the entrance to which is shown in Fig. 4. This passes through a tunnel under Chevrolet Avenue, its other end being located in the motor assembly building.

Cylinder heads go through a similar process in the plant across the street, except that some of the operations are performed at the bench. Fig. 5, for example, illustrates how the benches are fitted up for progressive operation. The heads which are cast in a single block are slid from one mar to another by way of a slotted track at each edge of the bench.

An interesting method of handling cylinder head blocks from the drill press department appears in Fig 6. The blocks are set up in a drill fixture which i mounted on small wheels. After one drilling operation is finished, the operator sets the fixture on the tabl which runs in front of the drill presses in the first row Thence it rolls upon th transfer table which appear in the middle foreground

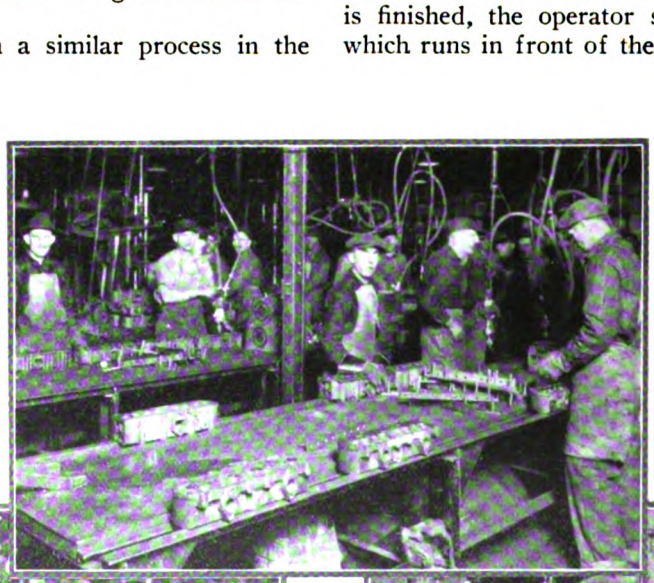
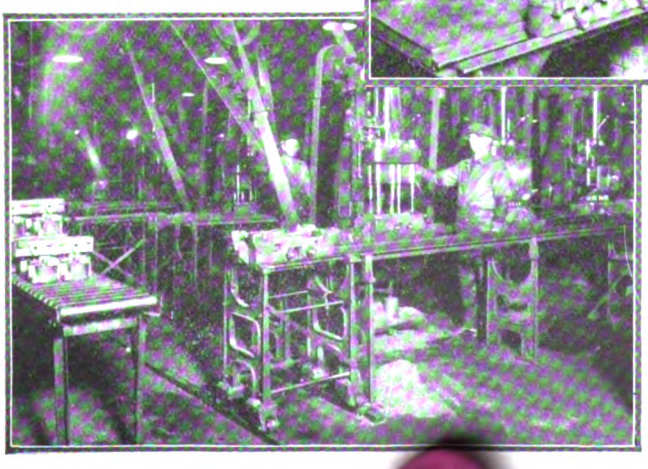


Fig. 5. Left: Progressive bend operations on the cylinder-hea blocks. They are slid by o workman to the next along t slotted guides at the edge of t table.

Fig. 6. In the center of the picture is a movable table used to transfer drill-fixtures containing cylinder-head blocks from the slide in front of one row of drills to that in front of another.



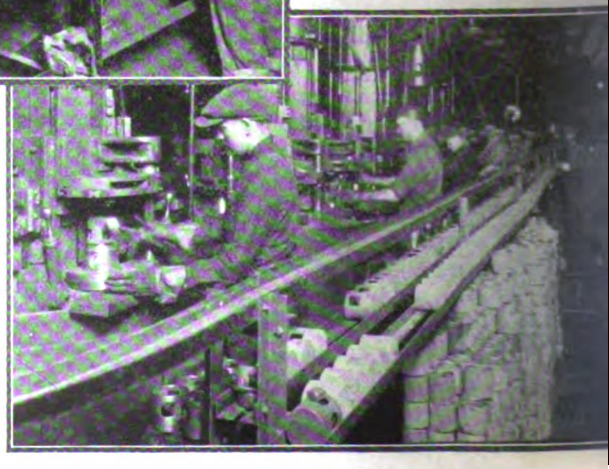


Fig. 7. Pistons in the process machining are rolled from o operation to the next on ord ary gravity chutes.

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Fig. 8. In another part of the piston section a belt conveyor is used to transport partly processed pistons from one operation to another and completed parts to the collection point.

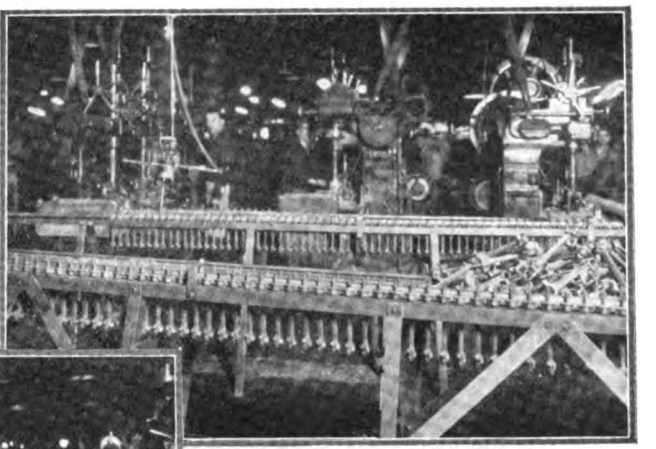


Fig. 9. Connecting rods are assembled on bars of the same diameteer as the crankshaft. The bar can be seen at the left of the connecting rods in the upper row.

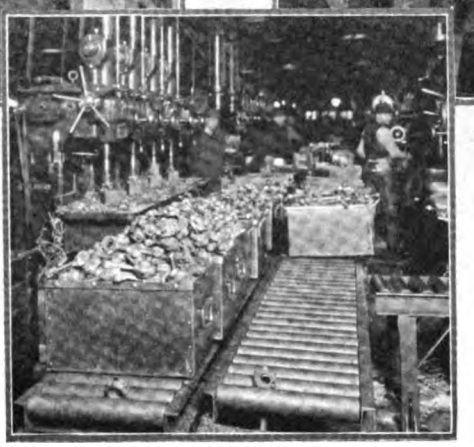


Fig. 10. A corner of the cam-shaft inspection department. The inspected shafts are travelling toward the observer on the narrow belt to be deflected down the chute in the foreground to a truck-skid.

of the picture. The transfer table moves the fixture to another row of drills for the next operation or if the drilling has been completed, to the roller conveyor shown at the left, which carries them to a subsequent operation.

Pistons are moved through the process principally on rollways or chutes, three of which are shown in Fig. 7. The chutes are inclined and the pistons simply roll along them from one station to the next. The exception is the power-driven belt-conveyor, shown in Fig. 8, which carries semi-finished pistons through a series of finishing operations. The belt is divided into halves by an imaginary line. Semi-finished pistons are placed on one side of the line and completed ones on the other.

The method of handling connecting rods through the several operations varies according to the nature of the operation, and the state of completion of the rod. Fig. 9, for example, shows the device used for assembling the connecting rods. It is a steel rod supported by a frame-work. Its diameter is the same as that of the crankshaft. The various parts of the connecting rods, caps, bolts and shims are united and adjusted on it. The connecting rods are slid along the bars between two groups of workmen, each of whom contributes an operation to the assembly.

For transit between succeeding operations, the rods are handled in steel boxes which move along roller conveyors, as shown in. Fig. 10, which also illustrates a branch or station at the right.

Finally, the steel boxes filled with connecting rods are dispatched to the

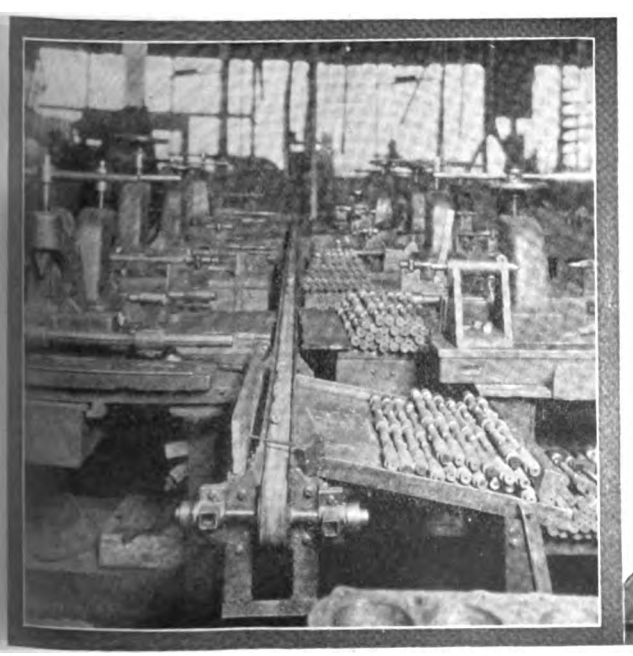


Fig. 11. Completed cam-shafts leaving benches after inspection pass onto this narrow belt conveyor whence they are deflected to the skids in the right foreground.

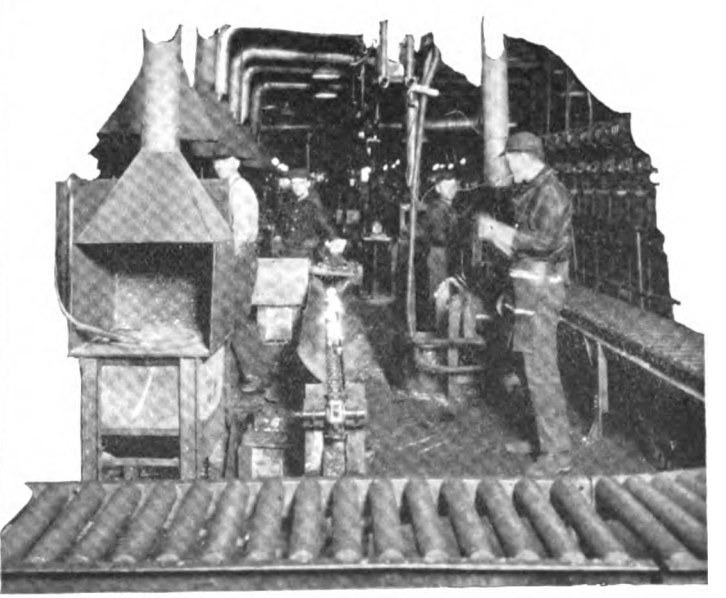


Fig. 12. Boxes of connecting rods arrive in the babbitting department on this roller conveyor. In the center foreground is a chain conveyor which carries the heated rods through a water spray.

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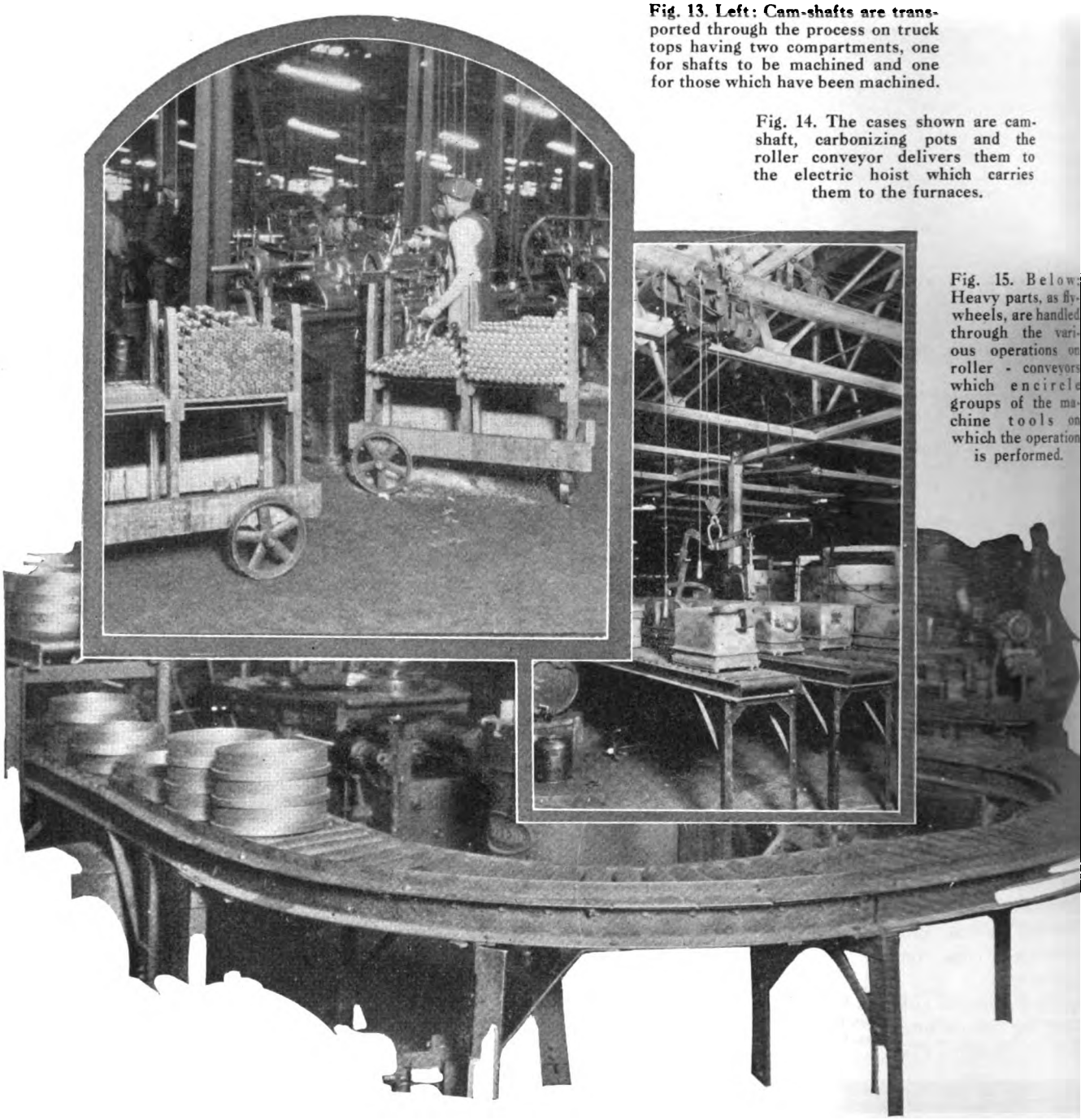


Fig. 13. Left: Cam-shafts are transported through the process on truck tops having two compartments, one for shafts to be machined and one for those which have been machined.

Fig. 14. The cases shown are cam-shaft, carbonizing pots and the roller conveyor delivers them to the electric hoist which carries them to the furnaces.

Fig. 15. Below: Heavy parts, as fly-wheels, are handled through the various operations on roller - conveyors which encircle groups of the machine tools on which the operation is performed.

babbitting room on the roller conveyors in front and to the right of Fig. 12. After the rods have been heated and babbitted, they are placed on the chain conveyor in the center of the illustration and carried under cold-water sprays.

It is important to bear in mind that the cylinders and cam-shafts are produced in one unit, while the other motor parts which we have mentioned as cylinder heads, pistons and connecting rods are produced in another. This, however, does not affect our discussion of the handling system.

To return to the cam-shafts. The processing here is largely one of turning and grinding, followed by heat treatment, straightening and inspection.

Consider the last operation first: The finished shafts are placed after inspection on the narrow belt conveyor shown in Fig. 11 along which they [illegible] as far as the deflector placed across the belt [illegible]ate foreground. This rolls the shaft o[illegible]nclined chute, which delivers to a waiting lift-truck skid.

The first operation in the production of cam-shafts is the shearing of the bars from which they are made. The short pieces are then placed on wheel-trucks like those in Fig. 13 and are brought to the machine rooms as required. The shafts are handled onto the same kind of trucks throughout the turning and grinding operations. The lathes and grinders are arranged in rows for progressive operation. As the illustration shows, the upper part of the truck is divided into two sections. The truck arrives at a machine with one section full and the other empty. It is placed beside the operator, who removes the pieces from one section, machines them and returns them to the other section. The truck is then moved to the next machine for the succeeding operation.

The cam-shafts finally arrive in the heat treatment room on the same trucks. There they are unloaded and placed in the carbonizing pots which are dispatched on

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the roller conveyors shown in Fig. 14. When the loaded pots reach the end of the conveyor nearest the observer, they are picked up by grab-hooks suspended from an electric trolley hoist and carried over to the furnace table. From that point, the pots are handled as described in the previous article on heat treatment. The empty pots are returned by trolley to the parallel roller conveyors by which they are delivered again to the loading end.

As may have been seen from the floor plan of the motor unit across the street from the cylinder and camshaft unit, the production department for each part is in an independent section. There the part is completely processed from raw material to a state of completion ready to be fed to the assembly line. The tools are grouped for progressive production and the materials in each section are handled largely by conveyors.

As a description of the conveyor system in each section would entail a certain amount of duplication, we shall notice only a few of the high spots.

Heavy parts, such as fly-wheels, are moved on roller conveyors which encircle groups of machines upon which they are processed. One of these groups and the corresponding conveyor appear in Fig. 15. Fly-wheel housings are handled as in Fig. 16. The latter view shows how completely the machines are served by the roller conveyor systems.

From Fig. 17, one may obtain some conception of the

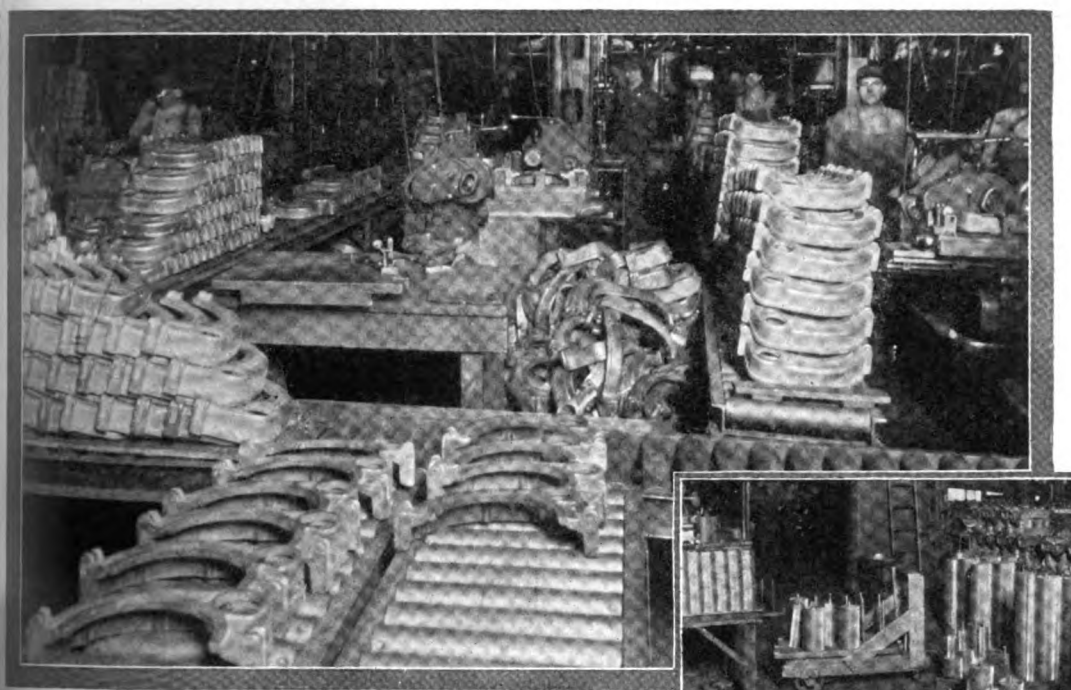


Fig. 16. Left: This view shows the complete system of roller-conveyors by which fly-wheel housings are moved through the machining operations.

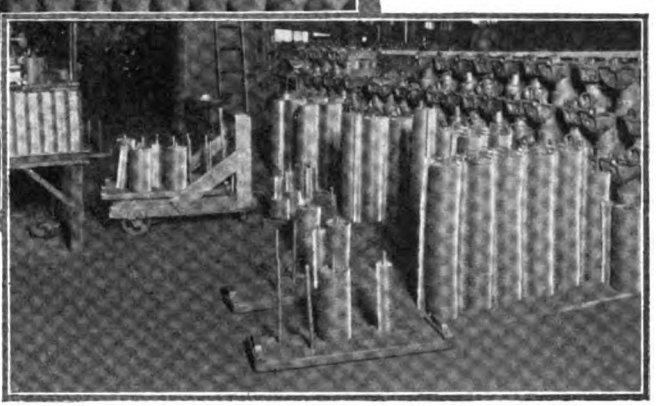


Fig. 17. Below: Timing gears are placed on spindles mounted on boards in the motor assembly unit. They are carried to the assembly lines on the wheel-truck shown. This view also shows crank-cases and cylinder-blocks ready for assembly into finished motors.



Fig. 18. These are small-part bins which border upon the assembly lines. The operators with their backs toward the observer are fastening the small parts to the partly completed assembly as it passes by.

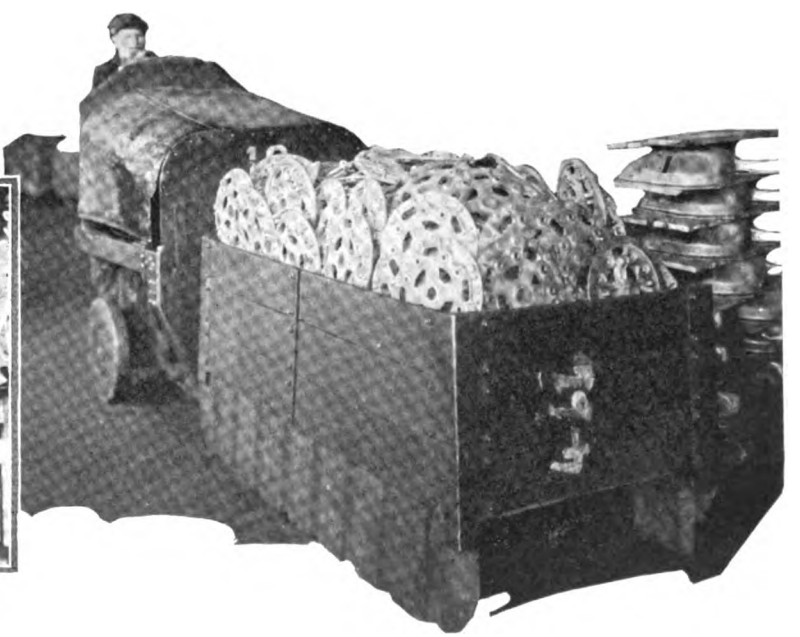


Fig. 19. Heavy castings are brought from the receiving platform into the store-room in skid boxes whose motor power is an electric lift-truck.

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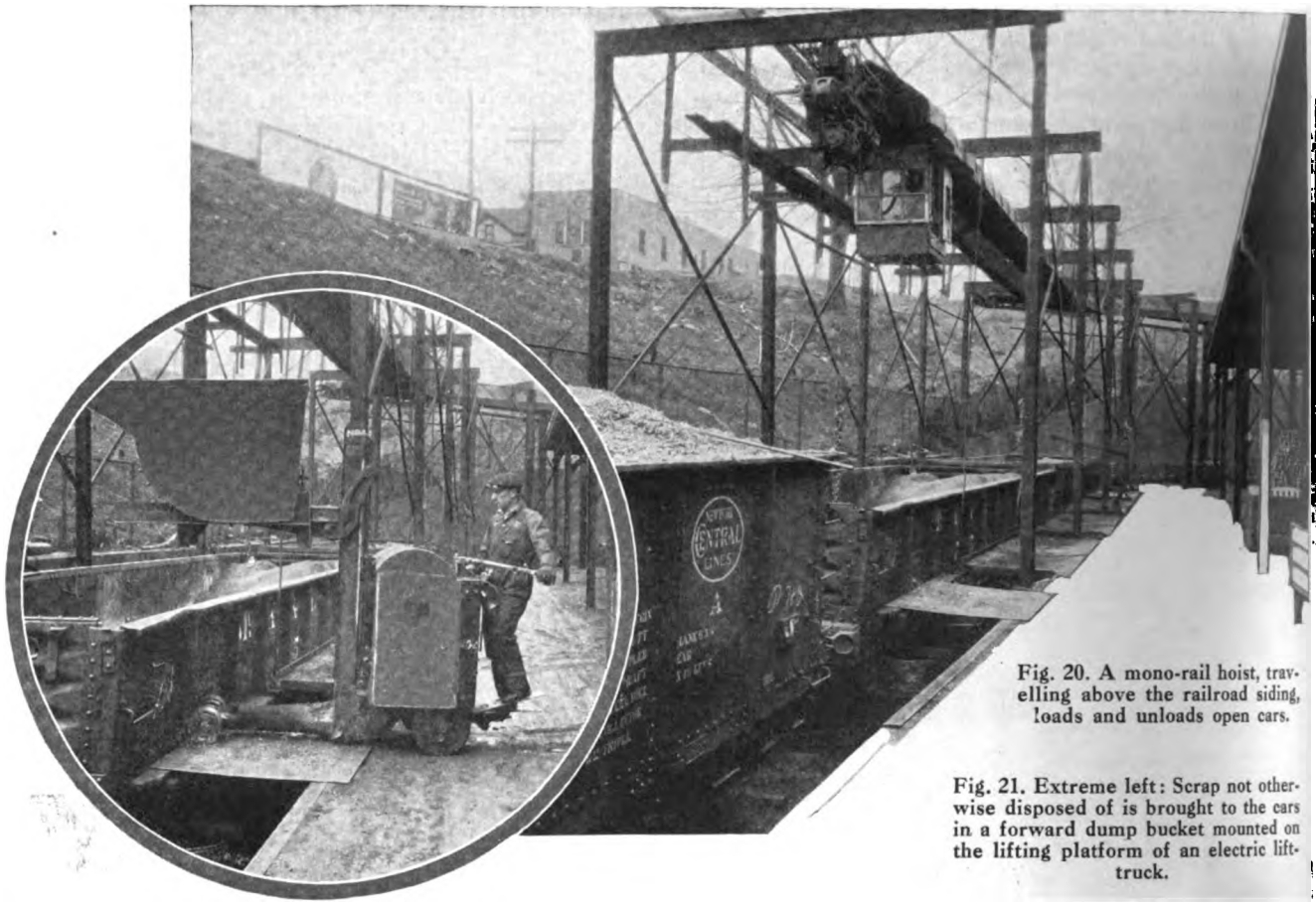


Fig. 20. A mono-rail hoist, travelling above the railroad siding, loads and unloads open cars.

Fig. 21. Extreme left: Scrap not otherwise disposed of is brought to the cars in a forward dump bucket mounted on the lifting platform of an electric lift-truck.

magnitude of the handling problem presented by production on Chevrolet's enormous scale. It is a corner of the motor assembly plant and shows masses of parts ready to proceed into the assembly lines. At the right is a row of crank-cases, each surmounted by a cylinder block, and although the illustration does not show it clearly, there are rows upon rows of these behind the first one. Also not shown in the illustration is a mono-rail trolley overhead from which hooks are suspended. Each hook carries four connecting rods. This is paralleled by another conveyor which carries the cam-shafts. Both groups are moving toward the assembly lines.

In the foreground are stacks of timing-gears awaiting call. The gears are transported on boards over whose spindles the large and small gears are stacked in equal numbers. At each end is a lifting strap by means of which the loaded board may be lifted, by hand or hoist, and placed upon the wheel truck which appears in the middle ground for movement to the assembly lines. Storage skids for timing gears of the same size are shown at the left.

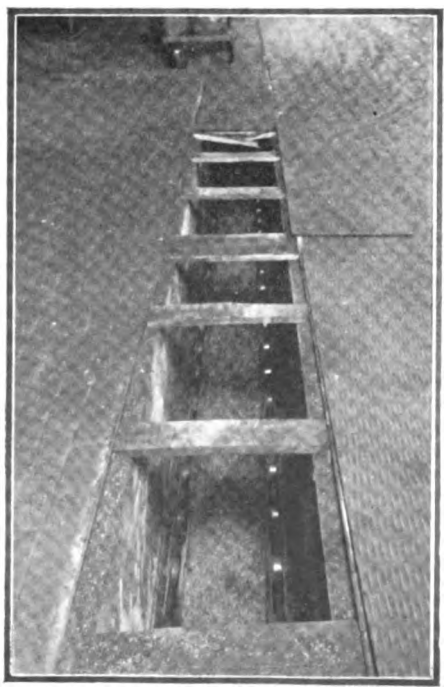
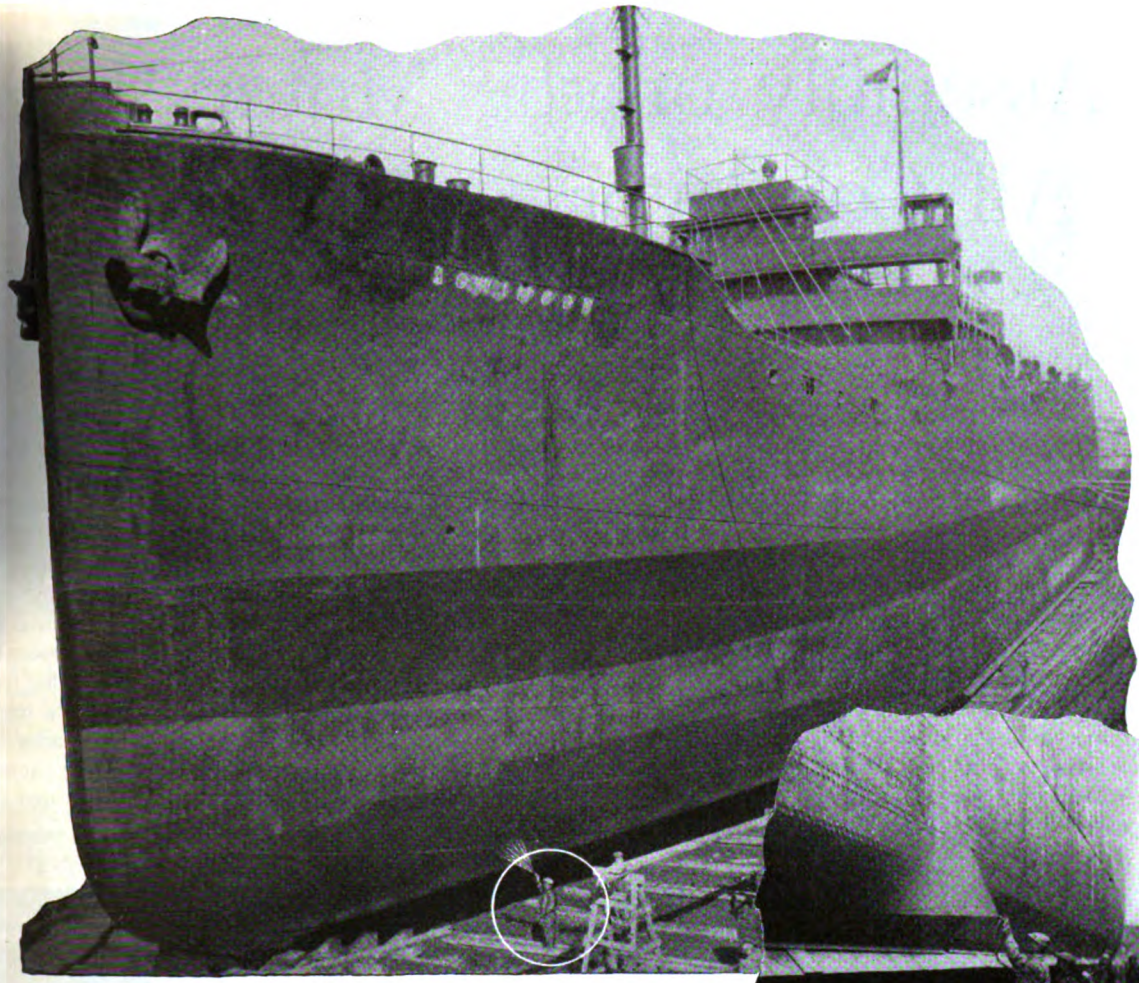


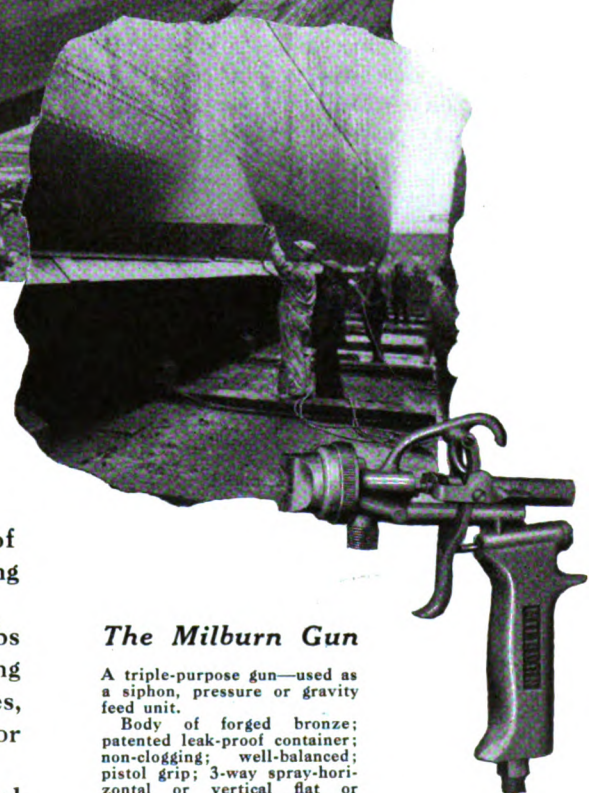
Fig. 22. Left: There is a complete system of underground conveyors for ...ng borings and turnings from ... machine rooms. At intervals gratings through which sweepings fall.



Fig. 23. Above: The underground conveyors terminate in the boot of this vertical elevator. Borings are discharged through the flexible spout into any desired section of the car.

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9,000 sq. ft. painted in one hour!

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Greater production and better finishes are easily obtained with the Milburn Spray. It operates on low pressure and permits a very fine atomization. "Orange-peel" is practically eliminated, thus minimizing sanding and rubbing.

One spray that will do all your painting—*5 times faster* than a brush—*saving 80% in time and costs!*

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Gentlemen:

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BALTIMORE, MD.

For Twenty Years - Manufacturers of Air Pressure Equipment

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The Assembly of the Motors Is an All-Conveyor Operation

MOTORS are assembled at the rate of nearly thirty thousand a week in three assembly lines at the Flint plant. These lines are power conveyors passing down a wide aisle in the center of the assembly plant and intersected at intervals by other conveyors (usually of the overhead type) which bring motor parts from the rooms in which they are produced.

The large illustration on this page shows how these lines look. Partly assembled motors are being carried along by power driven chain conveyors, which are fitted with special attachments for holding the motors. These attachments are pivoted so that the upper portion may be turned freely and the motor swung into any desired position for the ready attachment of parts.

The cylinder blocks reach the head of the assembly line by way of the tunnel conveyor under the street, as previously described. This conveyor discharges the blocks upon a roller conveyor which in turn brings them to the first operation, namely a steam-jet wash. After a thorough washing, they pass along to the first section of the assembly line. Here the crank-shafts are assembled and set in place and the crank-shaft bearings are tightened up.

The method of assembling and aligning the bearings is shown in Fig. 3 on the next page. Note the roller conveyor shunt. It is used to sidetrack motor blocks which require additional work before they are ready to continue down the assembly line.

The method of bringing in the crankshafts is indicated in Fig. 4. A continuous overhead chain conveyor with suspension hooks attached travels between the final inspection station in the crank-shaft room and crosses all the assembly lines. As soon as a crank-shaft has been passed by the inspector, it is hung on the first empty hook that comes along. The operators are placing the crank-shafts in the crank-case. In Fig. 5, the slat-conveyor is carrying finished cylinder head parts over the assembly conveyors for delivery to them.

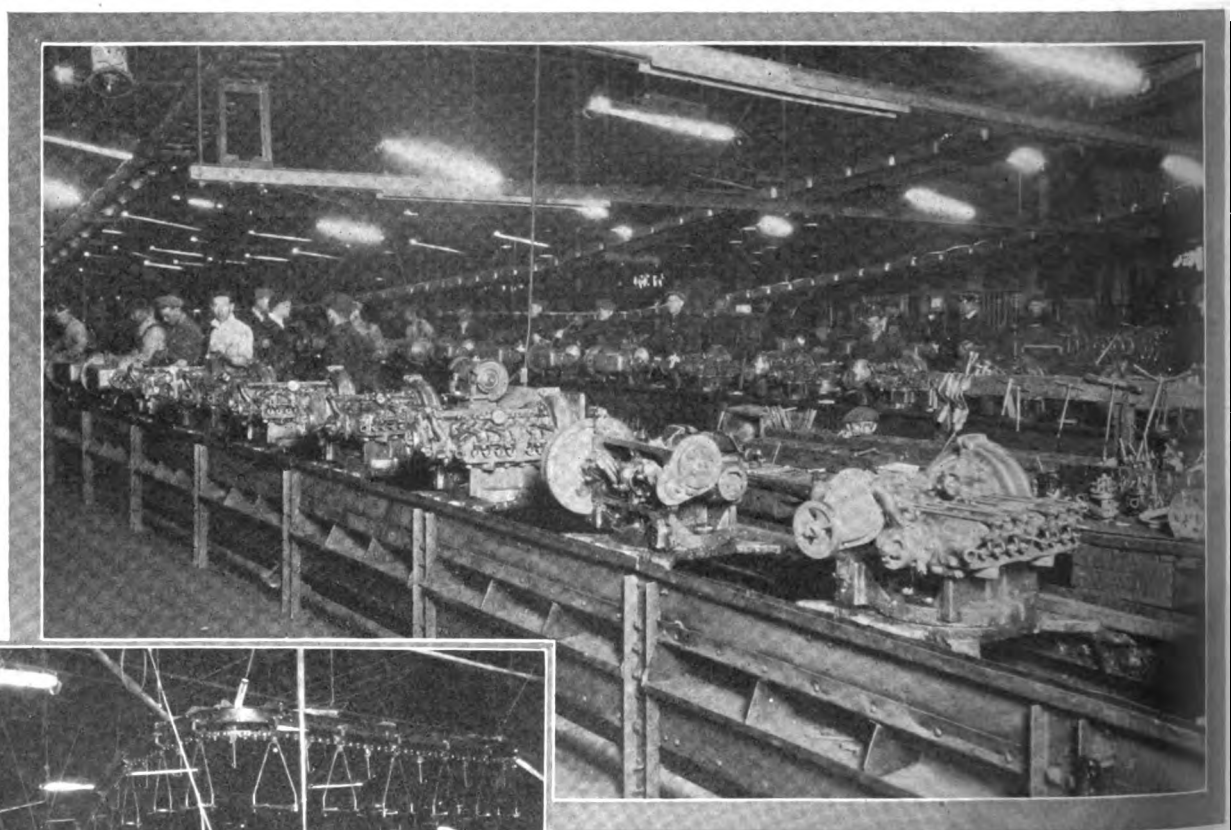


Fig. 1. Above: These are the three motor assembly lines which run nearly the full length of the plant. The steel frame-work houses heavy chain conveyors which move the motor slowly from one assembly operation to the next.

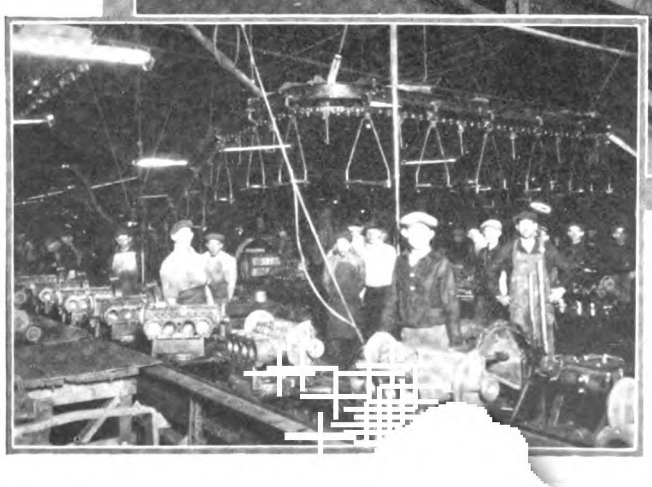


Fig. 2. Left: This view shows one of the mono-rail chain conveyors which brings small parts to the assembly line in the foreground.

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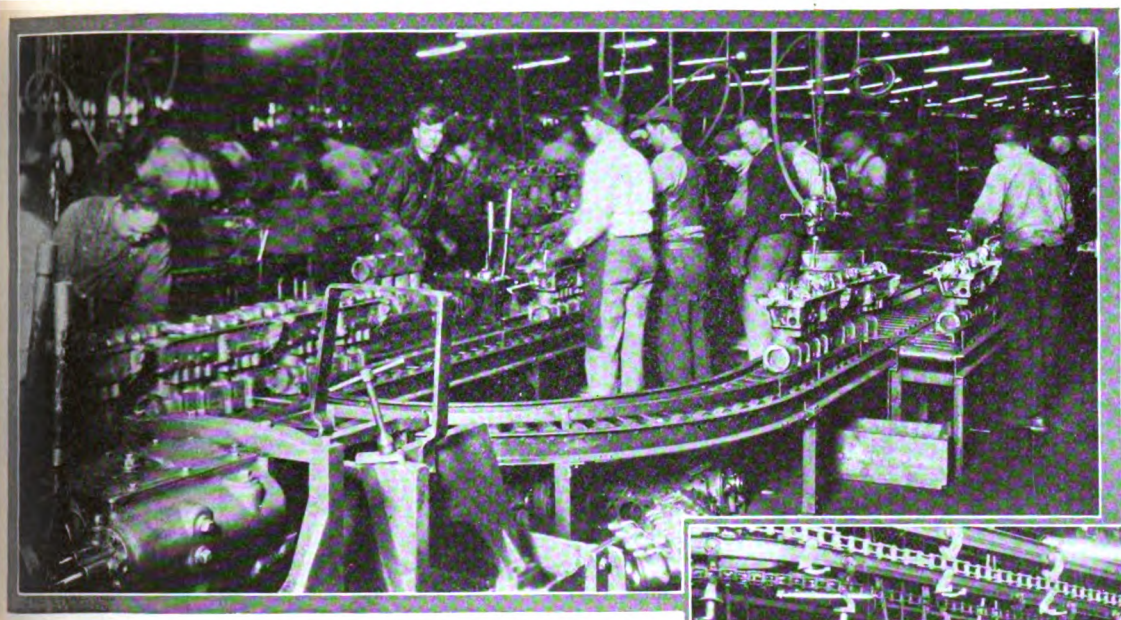


Fig. 4. Below: The crank-shaft feeder conveyor. The shafts are lifted from the hooks and stacked on the tables whence they are removed by a workman and handed to the operator who places them in the crank-case.

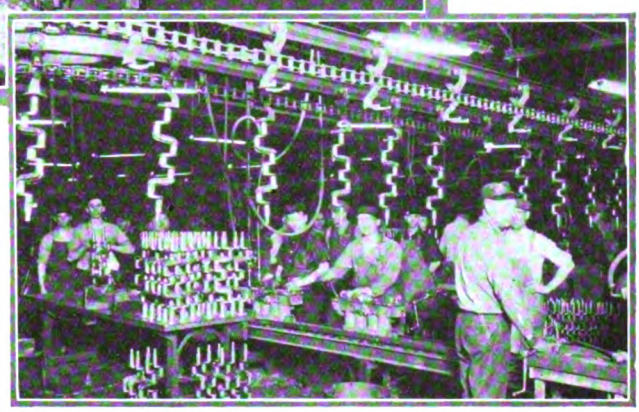


Fig. 3. Above: Testing the assembled motor and crank-case for alignment. Rejected blocks are side-tracked on the roller conveyor for adjustment.

Two views of the piston conveyor are shown in Fig. 6 and 7. Four pistons are placed upon each of the trays suspended from the conveyor by hangers. The pistons are removed from the trays and stacked up beside the assembly lines ready to be set in place in the engine motor block.

It may be noted here that the parts are not taken directly from the feeder conveyors and set in place directly in the assembly, but are placed on special racks so arranged that the parts may be easily and quickly removed from them.

An interesting use of the mono-rail chain conveyor is illustrated in Fig. 8. The hook rods nearest the observer are carrying the two cam-shafts. The next rod is supporting gear cover plates and the next four connecting rods. These parts are all delivered to the same point in the assembly cycle.

Other parts are brought in by similar conveyors, which do not call for further description.

The driving mechanism of the mono-rail chain conveyors is interesting. The motor shown in the upper left hand corner of Fig. 8 drives, through a single speed-reduction, a horizontal bevel gear of large diameter (about six feet), which is mounted on the same vertical shaft as the chain sprocket, which drives the conveyor. The mono-rail follows the curvature of the sprocket between it and

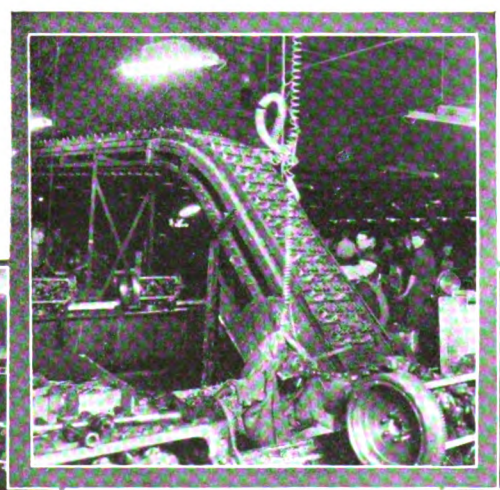
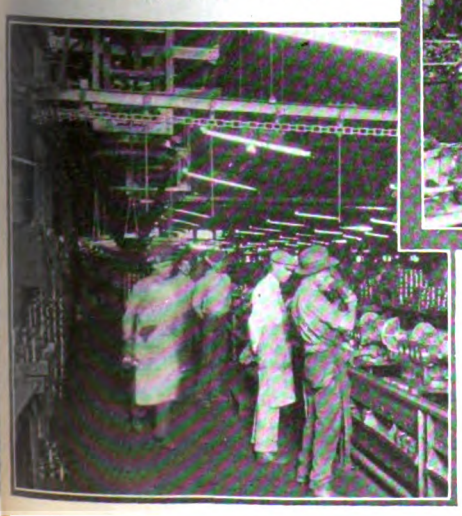


Fig. 6. Below: Pistons are brought from the room in which they have been produced in a mono-rail conveyor from which are hung a series of trays containing four pistons each.

Fig. 7. Below: Another view of the piston conveyor. The parts are removed from the trays and stacked upon platforms ready to be pushed into the cylinders.



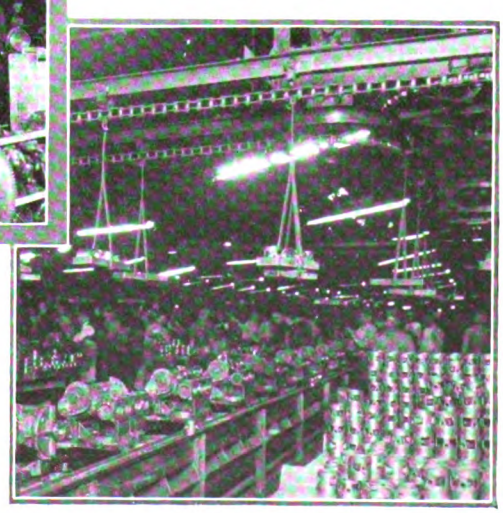


Fig. 5. Above: This is the slat-conveyor by means of which assembled cylinder head blocks are brought to the assembly lines.

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Fig. 8. Above: This mono-rail conveyor is carrying a variety of small parts. Among them are camshafts, gear housings and connecting rods. Each is removed from the hooks at the proper point in the assembly cycle.

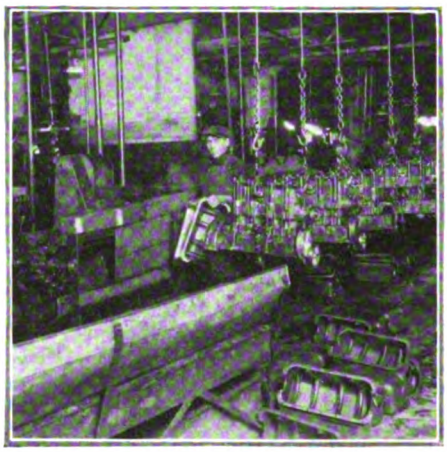


Fig. 9. After the motors are tested under their own power the oil pans are removed and the crank-cases drained of oil and water.



Fig. 10. Motors which do not pass final inspection are placed on these hand trucks and wheeled into the repair shop, for the correction of any defects which have developed.

the bevel gear. It may be added that variable speed transmission units have been successfully applied in several of the plants to the operation of conveyors which travel at more than one working speed.

When the motors reach the point illustrated in Fig. 14, that is, the end of the three assembly lines, they are transferred from the long power conveyors to an overhead mono-rail system for movement to the test department, where they are placed on the test blocks as in Fig. 12. The blocks are fitted with gas and exhaust piping and the motors are subjected to a severe test under their own power. Note in this illustration the pneumatic hoists over the test blocks. These can be swung over so as to remove the motors from the mono-rail chains and to set them on the test blocks. Note, also, the large pipe on floor in the center of the picture which receives the exhaust from



Fig. 11. Above: The inspection line. The motors are carried on a power conveyor through a group of inspectors, each of whom examines a specific part.

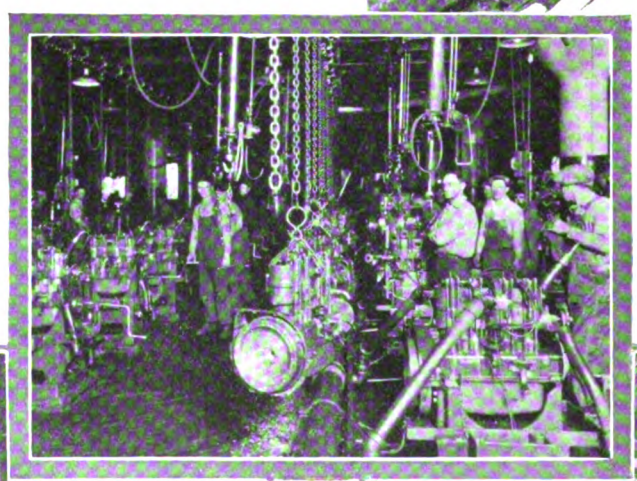


Fig. 12. Left: The motors reach the test blocks, suspended from a mono-rail conveyor. They are set in position for testing by pneumatic hoists above the blocks.

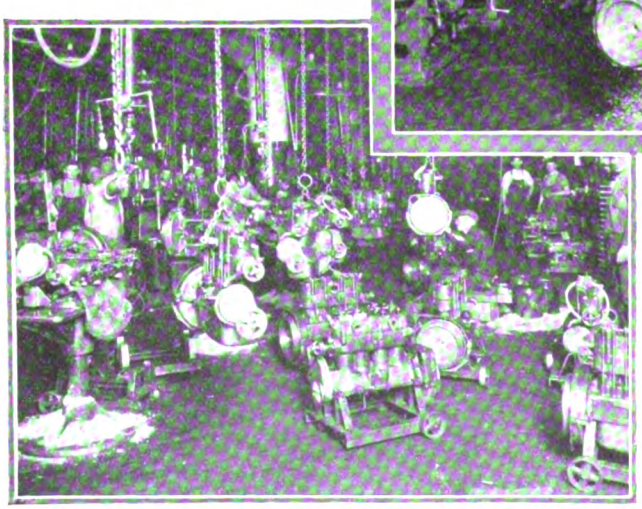


Fig. 13. The repair department which is a universal machine shop for the correcti[on] of defects. After being repaired, the m[otors] back for another te[st]

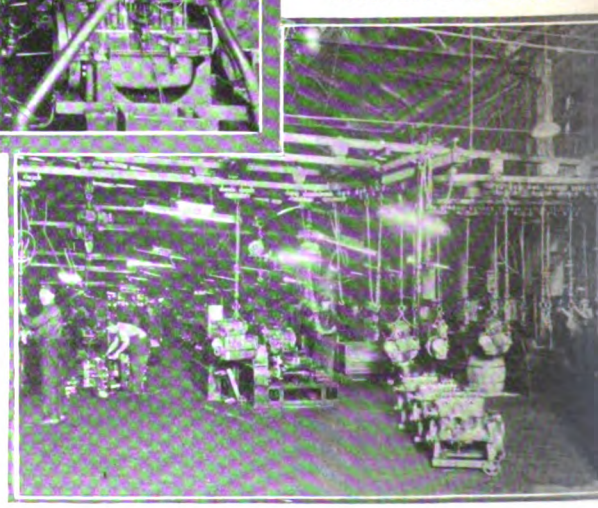


Fig. 14. The finished motor end of the assembly line where the motors are transferred to a mono-rail system leading into duplicate testing rooms.

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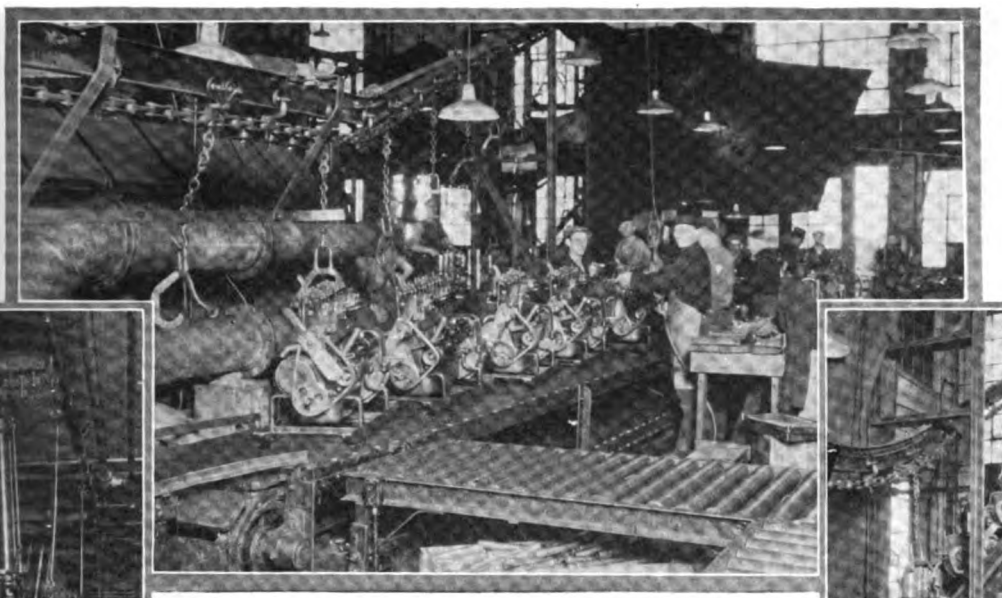


Fig. 15. Above: The motors arrive from the testing rooms on the roller conveyor in the foreground and pass to the slat-conveyor where they receive the small accessories. They are then picked up by the hooks of the mono-rail conveyor to be painted at the next station.

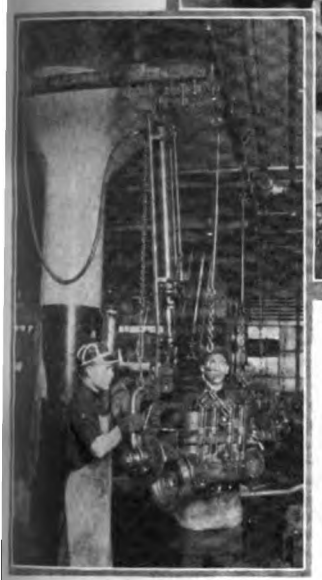


Fig. 16. Above: showing how the motors are transferred from the trolley to the travelling pneumatic hoist which places them upon the power driven inspection conveyor shown in Fig. 11.

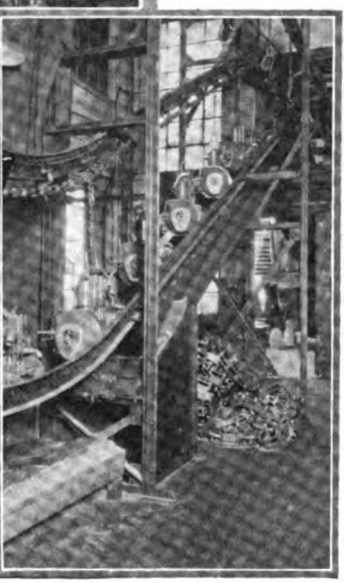


Fig. 17. Completed and painted power units leaving the assembly plant for the loading platform. The mono-rail is bent upwards to leave head room in the passage-way beyond the building.

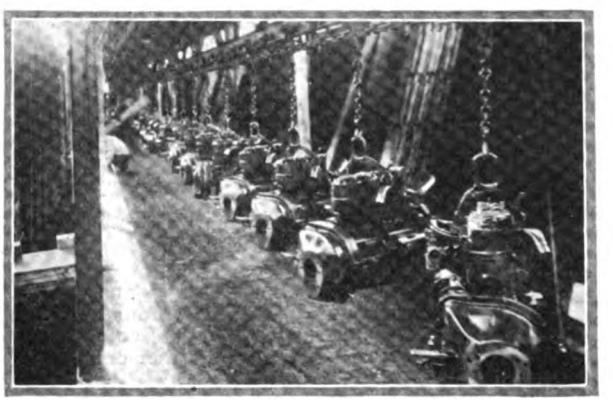


Fig. 18. Above: Motors arriving by mono-rail on the loading platform. There are two of these serving three standard gauge spurs.

all the motors and discharges it out of doors.

After the test, the motors are conveyed by the same monorail system to the final inspection department. On their way, they pass the point depicted in Fig. 9, where the oil pans are removed and all oil and water are drained from the motors. Here they are disassembled, thoroughly inspected and reassembled. Defective motors are placed on the small wheel-truck shown in Fig. 10 and brought to the repair department, a section of which is shown in Fig. 13.

Those motors which have passed inspection continue on through the trim lines where the various motor attachments are applied. The completed motors pass by roller conveyor to a power slat-conveyor, which delivers them finally to another mono-rail chain. All these conveyors are shown in Fig. 15.

While the motors are suspended from the mono-rail, paint is sprayed on them. They then continue by way of the mono-rail out of the plant and on to a shipping platform as shown in Figs. 17 and 18. The last illustration shows the motors being moved from the mono-rail suspension to wheel trucks on which they are rolled into the box cars for shipment.

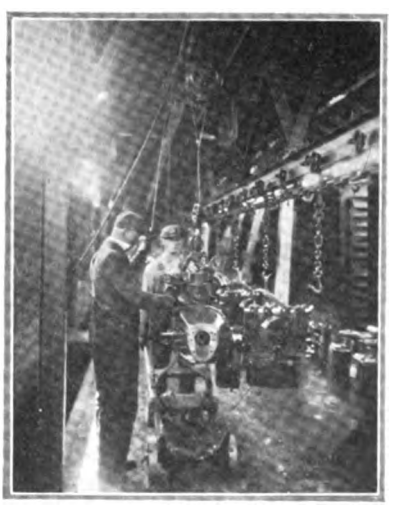


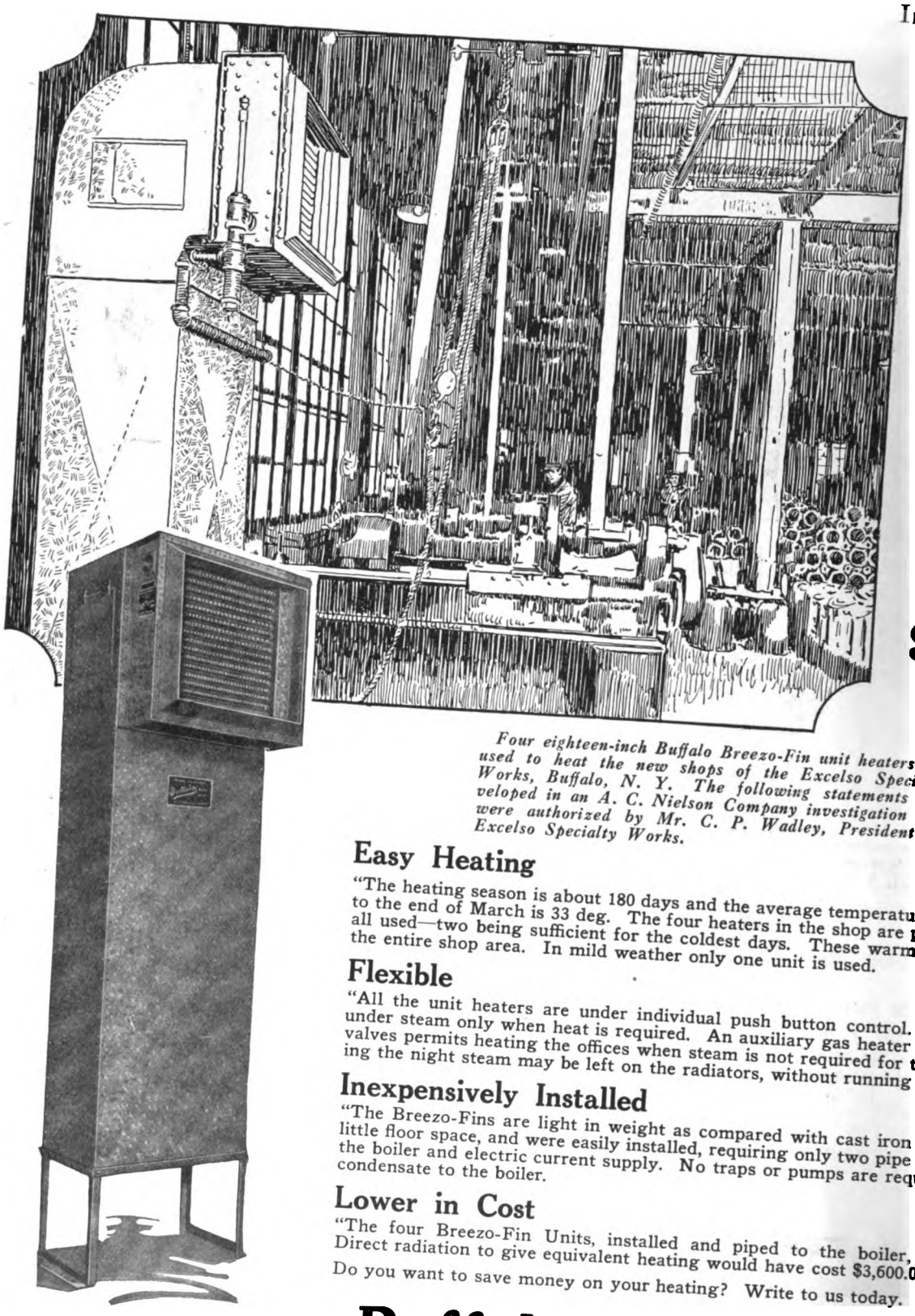
Fig. 19. The mono-rail conveyor is unloaded by means of a travelling electric hoist. It is also used to place the motors on wheel trucks which carry them into the cars.

It may be added that the sheet metal oil pans are manufactured on the second floor of the plant and are brought to the proper point in the assembly lines by means of gravity conveyors. These are shown in Fig. 1 directly over the assembly conveyors.

In addition to the principal manufacturing and assembling departments, the plant has several auxiliary departments. There is a store room, for example, where small stock parts and mill supplies are kept. There is also a fully equipped tool-crib.

Outside the main walls of the building are: (a) The babbitt reclaiming room; (b) a welding room, and (c) a grinding room for rough grinding those castings which require it.

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Here's what the President says:

Four eighteen-inch Buffalo Breezo-Fin unit heaters are used to heat the new shops of the Excelso Specialty Works, Buffalo, N. Y. The following statements developed in an A. C. Nielson Company investigation and were authorized by Mr. C. P. Wadley, President of Excelso Specialty Works.

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"The heating season is about 180 days and the average temperature from October to the end of March is 33 deg. The four heaters in the shop are all used—two being sufficient for the coldest days. These warm the air thruout the entire shop area. In mild weather only one unit is used.

Flexible

"All the unit heaters are under individual push button control. The boiler is under steam only when heat is required. An auxiliary gas heater with automatic valves permits heating the offices when steam is not required for the shop. During the night steam may be left on the radiators, without running the fans.

Inexpensively Installed

"The Breezo-Fins are light in weight as compared with cast iron types, take up little floor space, and were easily installed, requiring only two pipe connections to the boiler and electric current supply. No traps or pumps are required to return condensate to the boiler.

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"The four Breezo-Fin Units, installed and piped to the boiler, cost $905.00. Direct radiation to give equivalent heating would have cost $3,600.00."

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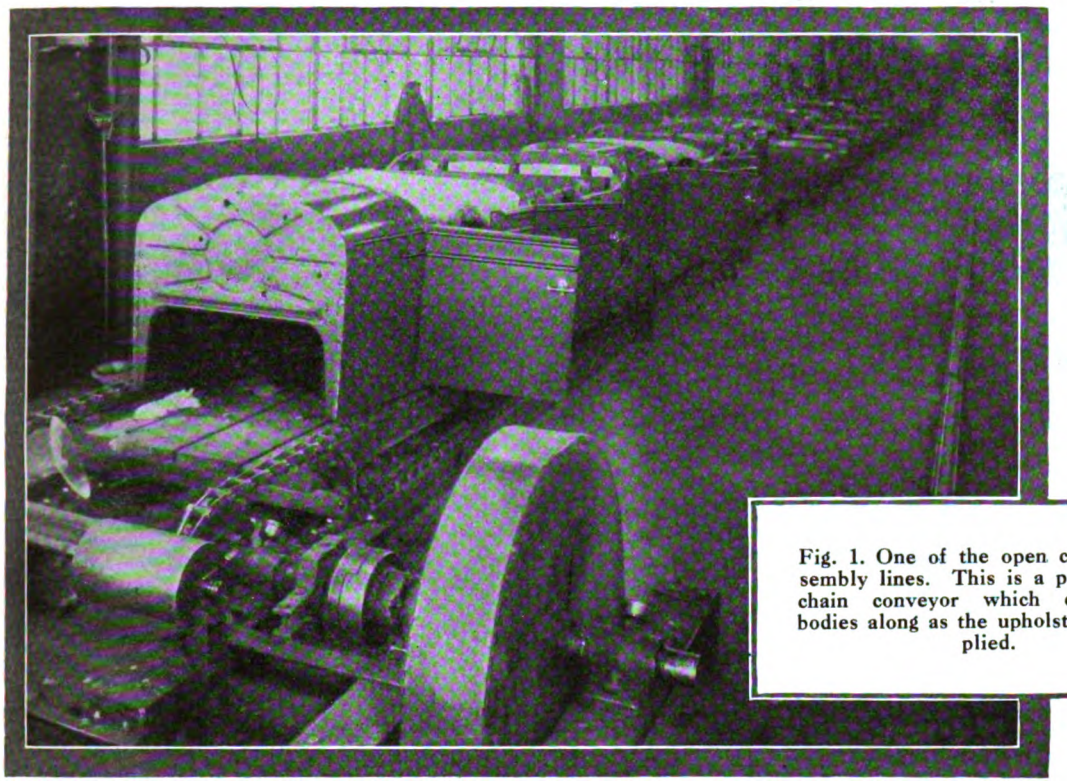


Fig. 1. One of the open car body assembly lines. This is a power-driven chain conveyor which carries the bodies along as the upholstering is applied.

The Cars Are Assembled While Moving Along on Conveyors

AS our readers are familiar with the principle of motor car assembly, we shall present only the general plan of operation with particular reference to the conveyors and trucks used in the process. Chevrolet has one main assembly plant at Flint and six final assembly plants at Tarrytown, St. Louis, Oakland, Janesville, Norwood and Buffalo. There is also a Canadian assembly plant at Oshawa, where Chevrolet cars are assembled in full and where some of the other General Motors' cars are partially assembled. The plant at Bloomfield, N. J., serves as a concentration center for all cars and parts which are to be shipped abroad.

As the system of assembly is about the same in all the plants, we shall confine ourselves to a description of the methods in use at Flint. Chevrolet does not build bodies for its cars with the exception of those for open cars and motor trucks which are built at Flint. Bodies for the closed cars are built by the Fisher Body Division of General Motors in plants located near the assembly plants.

The continuous conveyor principle as already described in the case of the motor assembly plant, is also

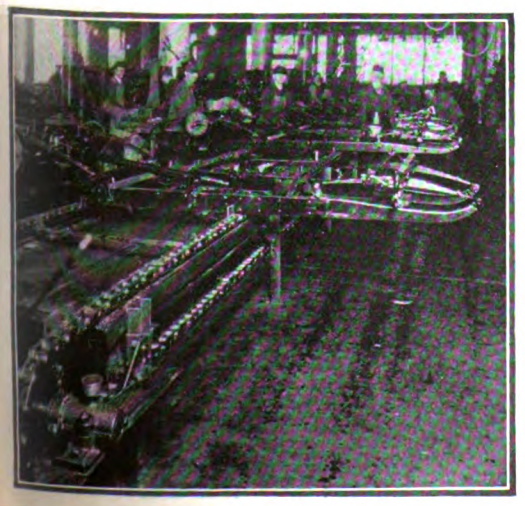


Fig. 2. At the left is a power-driven chain conveyor on which the frames are assembled, the principal work being that of applying the axles and springs.

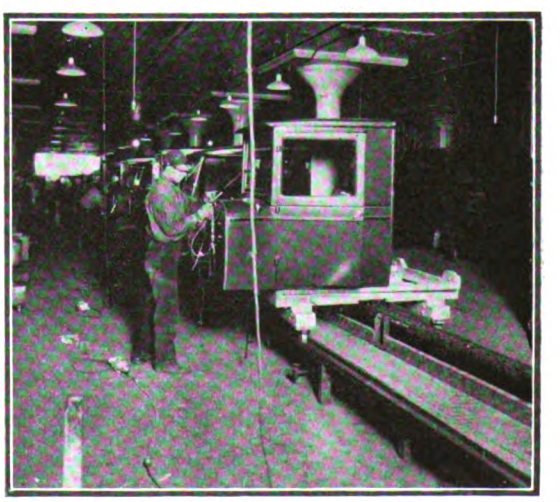


Fig. 3. Truck cabs are assembled on still another type of power-driven chain conveyor, the cabs being supported on small trucks or dollys.

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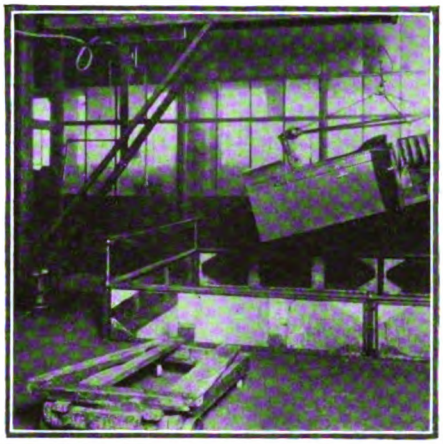


Fig. 4. The bodies are finished completely on the floor above the chassis assembly lines and are lowered by pneumatic hoists directly on the chassis as it passes under the hoist.

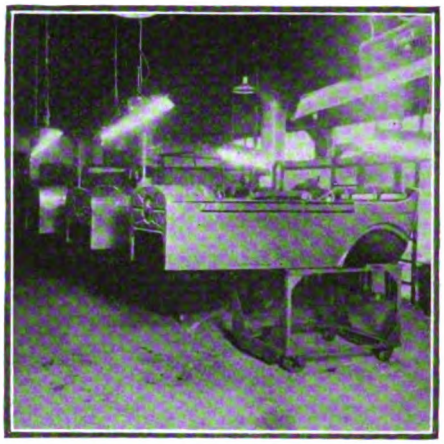


Fig. 5. Such trucks as these are used during the painting and striping operations, after which the bodies pass through drying ovens on power conveyors.



Fig. 6. Closed car-bodies are assembled on a single power-driven chain conveyor and are supported on dollys or trucks such as that shown. These bodies are built by Fisher in an adjacent plant.

applied to the assembling of the finished cars. The different classes of parts entering into the finished car are placed at the proper points in the assembly lines, of which there are two in the Flint plant.

The first step in the process is the assembly of the frames which consists simply of the attachment of springs and axles. This is completed on the chain conveyor shown in Fig. 2, after which the frames are placed on supports carried by power driven chain conveyor, which is the assembly line proper.

As the chassis moves along, the motor is set in position. It is followed by the steering gear, radiators and other parts. Finally the wheels with inflated tires are set in place and the chassis leaves the conveyor and rolls along on a track. It is propelled by another power driven chain, having lugs which engage the front axle.

The fenders, guards, running boards and other parts are attached to the moving chassis. Finally the finished body is lowered from the floor above by pneumatic hoist and attached to the chassis. The electrical connections to the horn and lights are then made, the radiator is filled and a small quantity of gasoline and oil supplied. Then the motor is started and the car is driven to another conveyor like the one it has just left. Here it receives a final inspection as it passes down the line

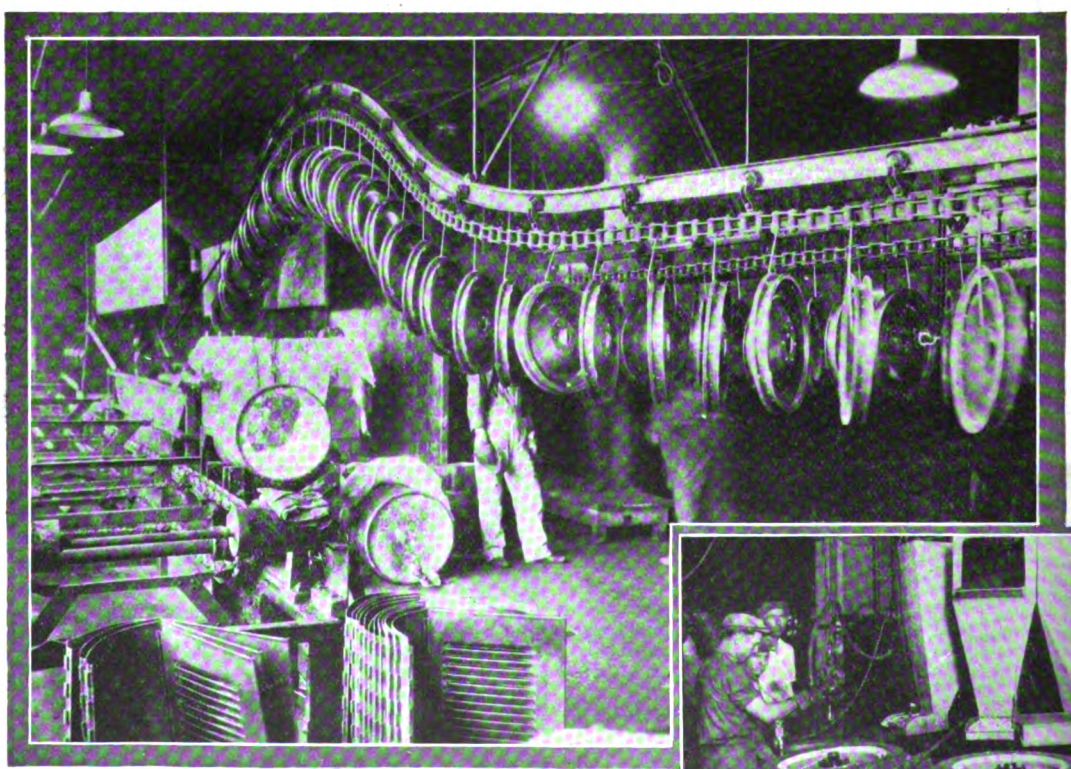


Fig. 7. Disc-wheels during the finishing processes are handled on mono-rail power-driven chain-conveyors such as this. At the left is a power-conveyor which carries the car bodies through drying ovens.



Fig. 8. Tires are applied to the disc-wheels on this table, which has a revolving top. The containers in the center hold the lugs, nuts and other wheel-parts.

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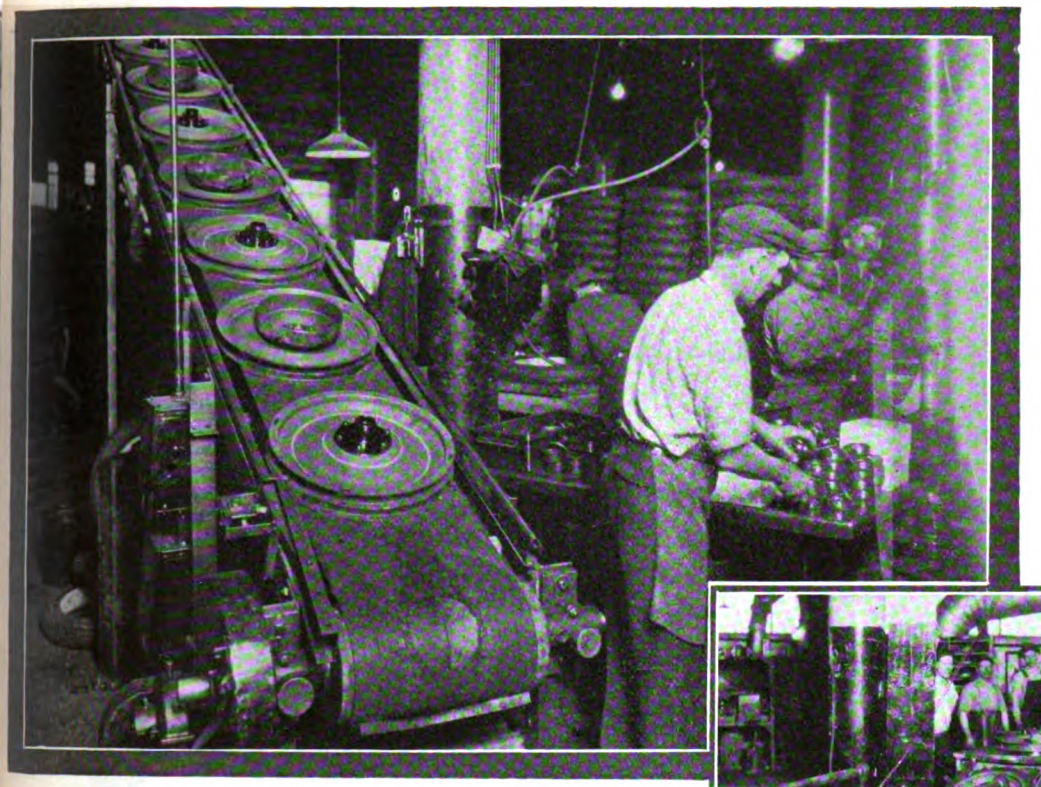




Fig. 9. These two views show the assembling of the disc-wheels and the belt conveyor which carries them to the tire assembly bench shown in Fig. 8. The wheels are assembled at the bench shown below and are carried to a lower floor by the conveyor, where the operator at the left applies the wheel - bearings and passes the wheels to the tire-assembly bench.

of inspectors, each of whom examines certain parts. The cars are then driven either to the garage for minor adjustments or for delivery under their own power or by rail, as the case may be.

Wherever possible, parts are painted on conveyors which carry them directly through the drying ovens.

The bodies and truck cabs which are built at Flint are assembled by progressive operations on conveyors shown in Fig. 3. The same is true of the wheels. Since a spare is supplied for each car, a production schedule of 100,000 cars a month calls for 500,000 wheels.

The wheels are assembled on a work bench as shown in Fig. 10, after which they are placed on a belt conveyor, which leads them to the floor below. Here the operators remove the wheels from the belt, apply the bearings and pass the wheels to the tire assembly bench. This is a table with a circular top. The operators surround the table, and as each completes his work on the wheel the table is given a quick turn which passes all the wheels on it to the next operators. Of course, the work of the men is timed so that they all finish at once.

In the nature of the assembly plant, there is more use for conveyors than for trucks. Still, trucks are employed in some of the departments, for example, the body painting and striping department. Here steel trucks are used of a height sufficient to allow the body to be painted with the greatest convenience.

Trucks are also used in the wheel department. One of them is shown in Fig. 11.

Fig. 10. As five rims are required for each car, Chevrolet handles upwards of 500,000 of these every month.

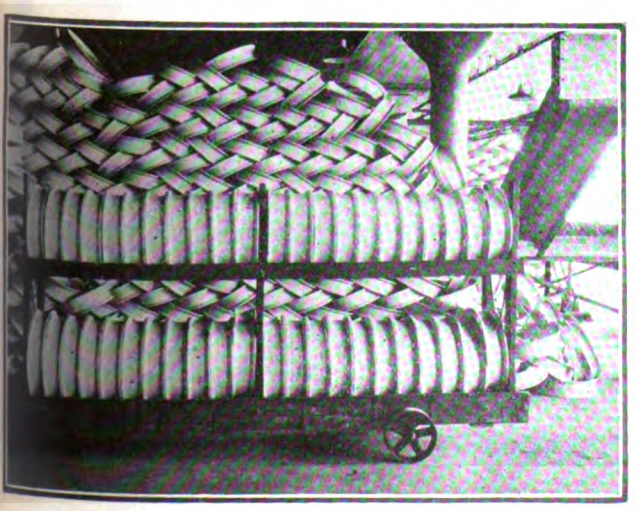
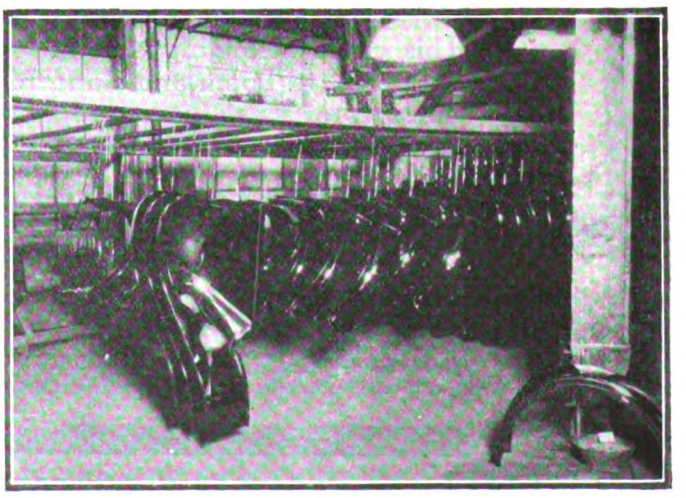
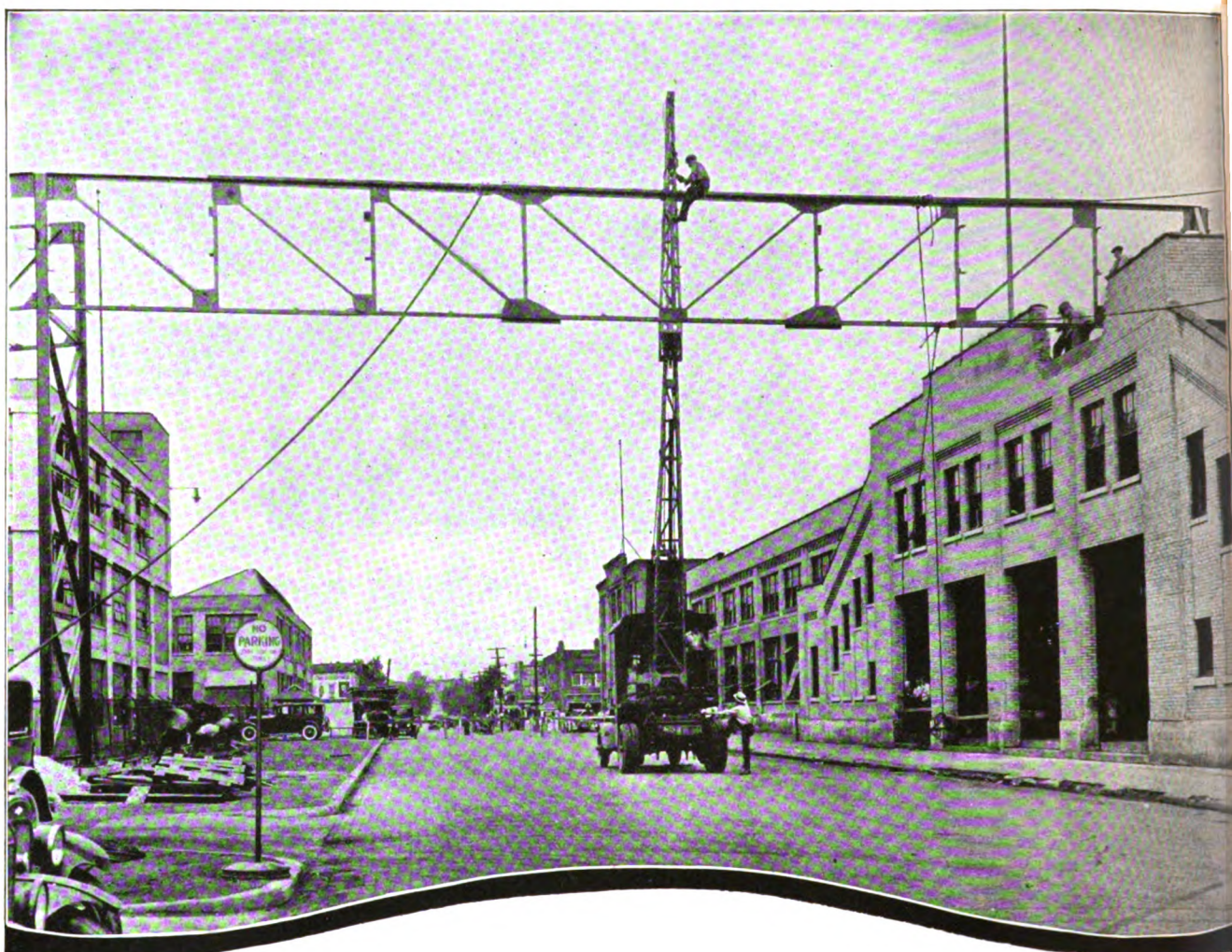


Fig. 11. Chassis sheet metal parts such as fenders and splash-plates are painted and dried while on this conveyor.



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Where 40 tons erected was considered a good day's work, this Superintendent with a

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The G-E HIGH TORQUE DOUBLE SQUIRREL CAGE MOTOR

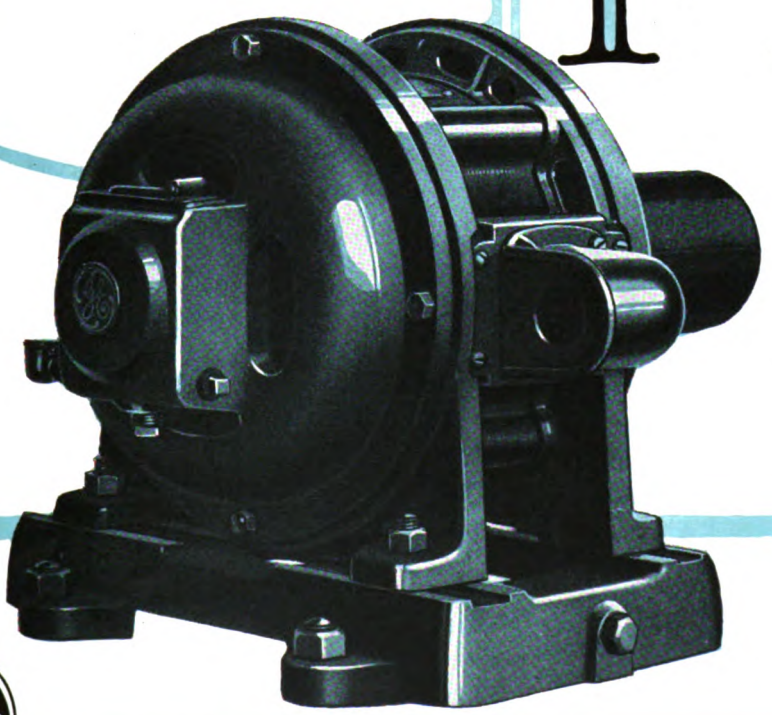
The load requirements of certain drives are best met by motors having the combination of advantages possessed by the FTR:

- High starting torque
- High sustained acceleration torque
- Quick, positive action
- Low starting current
- Adaptability to simple control

The Type FTR is the equal of the ordinary squirrel cage motor in simplicity, mechanical rigidity, and dependability.

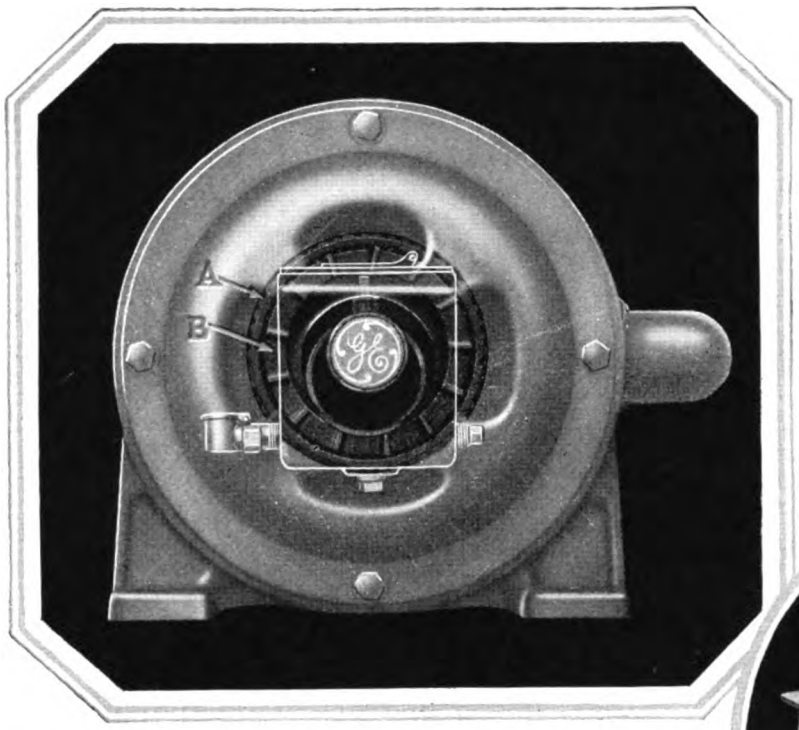
TYPE

FTR

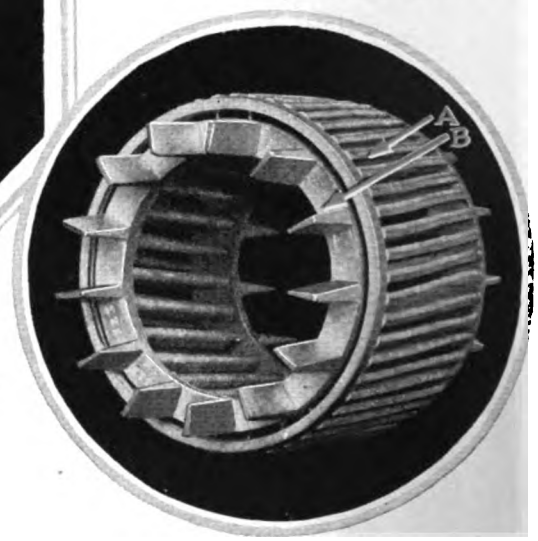


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Automobile-plant Machinery
Bakery Machinery
Candy Machinery
Canning Machinery
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Milling Machines
Pulverizers
Reciprocating Compressors
Reciprocating Pumps
Refrigerating Machines
Revolving Screens
Textile Machinery

A marks the outer high-resistance, low-reactance winding. At start, most of the current follows this outer winding.

B marks the inner low-resistance, high-reactance winding. As the motor comes up to speed, the flow of current in "B" increases, thus winding "B" becomes the more active portion of the rotor circuit.

Winding "A" gives the FTR its high starting and accelerating torque with minimum line disturbance. Winding "B" assures good efficiency and close regulation under full-load operation.

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Labor Saving Methods at the Other Chevrolet Plants

Power House Equipment Is Arranged so as to Eliminate Handling Fuel or Ashes

THUS far we have confined ourselves almost exclusively to the principal manufacturing plants of Chevrolet in Detroit, Toledo and Flint, since these plants are representative of the manufacturing and handling methods as a whole. There are, however, individual installations of equipment in some of the power stations in the export plant at Bloomfield, the sheet metal unit in Flint and the small parts plant at Bay City, which merit some study. At the power stations, for example, one of which is in Flint, the other in Detroit, steam shovels are employed for unloading and handling reserve fuel. One of them is shown in Fig. 9. The shovel is mounted on standard gauge trucks and is advanced along the track to a point between the car to be unloaded and the fuel pile. It is fitted with a clam-shell bucket of the usual type. There is also, at the Flint power plant, an overhead travelling crane whose runways are over the coal bunkers. It is fitted with a clam-shell bucket which takes coal from the bunkers and drops it in the hoppers, from which it is fed to the stokers. The Detroit power station is really a part of the drop-forge unit, but it supplies power for the gear and axle unit as well. At this plant, coal is dumped from the cars into a track hopper and is elevated by a bucket conveyor to the overhead storage bin. From here, it is fed to an overhead con-



Fig. 1. A view in the motor plant at Flint showing the use of a portable elevator for stacking containers of small motor parts.



Fig. 2. Weighing small kegs of materials in the stores department, the kegs being placed on the scales by means of a hand truck with a hook engaging the top of the keg.

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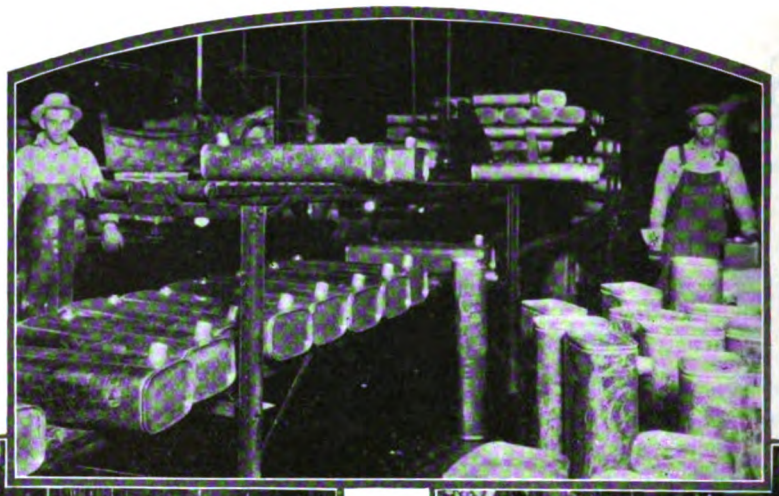


Fig. 3. Many of the production operations on gasoline tanks are performed as the tanks move along on conveyors. A view in the sheet metal plant at Flint.

Fig. 5. The illustration below shows how seams in gasoline tanks are soldered as the tanks are carried along on a chain conveyor.



Fig. 4. Fender and other sheet metal chassis parts are handled on roller conveyors in the pressed metal plant.

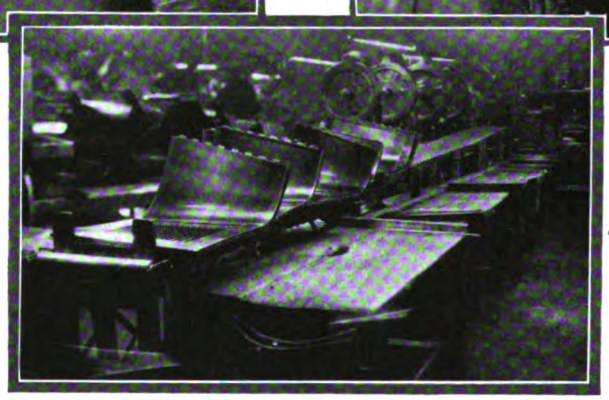


Fig. 6. The view at the left shows the equipment used in the pressed metal plant for handling hoods.

veyor which supplies the stoker hoppers. The amount of coal fed to each is automatically weighed and recorded.

The ash removal system at this plant is as follows: The ashes fall from the grates into hoppers, discharging into the dump cars. They carry the ashes directly to the skip hoist bucket, which dumps the ashes into an overhead bin, with discharge gates above the railroad spur.

At the Bay City plant, where small parts are made, the principal operations are performed on screw machines and in the heat treating department. Most of the materials are handled in boxes, which are placed on trailers or skids. Motive power is furnished by a tractor or lift-truck. In fact the handling equipment is much the same as that in the Detroit plant.

There is a sheet-metal plant at Flint, where the chassis parts, as gasoline tanks, fenders, running boards, hoods and guards are made. The sheets are unloaded and handled, in and out of the plant, by overhead travelling cranes. They bring the sheets to the presses, which are placed close together so that very little power handling equipment is required until the parts are completed. Then they are picked up by a mono-rail and taken to the shipping platform.

The gasoline tanks and fenders are handled on roller-conveyors, as shown in Figs. 3 and 4. A chain-conveyor is used for carrying the gasoline tanks through a soldering operation. To give some idea of the magnitude of the work done in this plant, here are some statistics on the fender presses: They weigh one hundred tons, exert a pressure of one hundred and fifty tons and turn out a fender every ten seconds.

The work done at the export plant in Bloomfield is principally packing and crating parts for shipment abroad. Some cars are assembled here, but it is not considered an assembly plant.

As far as handling equipment is concerned, there are roller conveyors resting on the floor, upon which boxes are placed, to be filled with

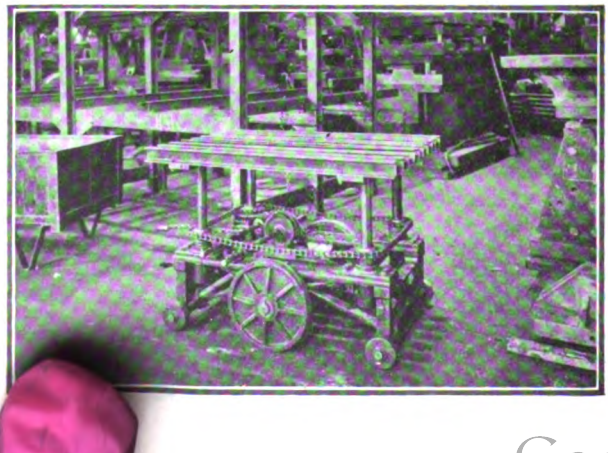


Fig. 7. Trucks like this are used for placing punching and forming dies in the presses. It has an elevating table operated by the gears, chains and screws.

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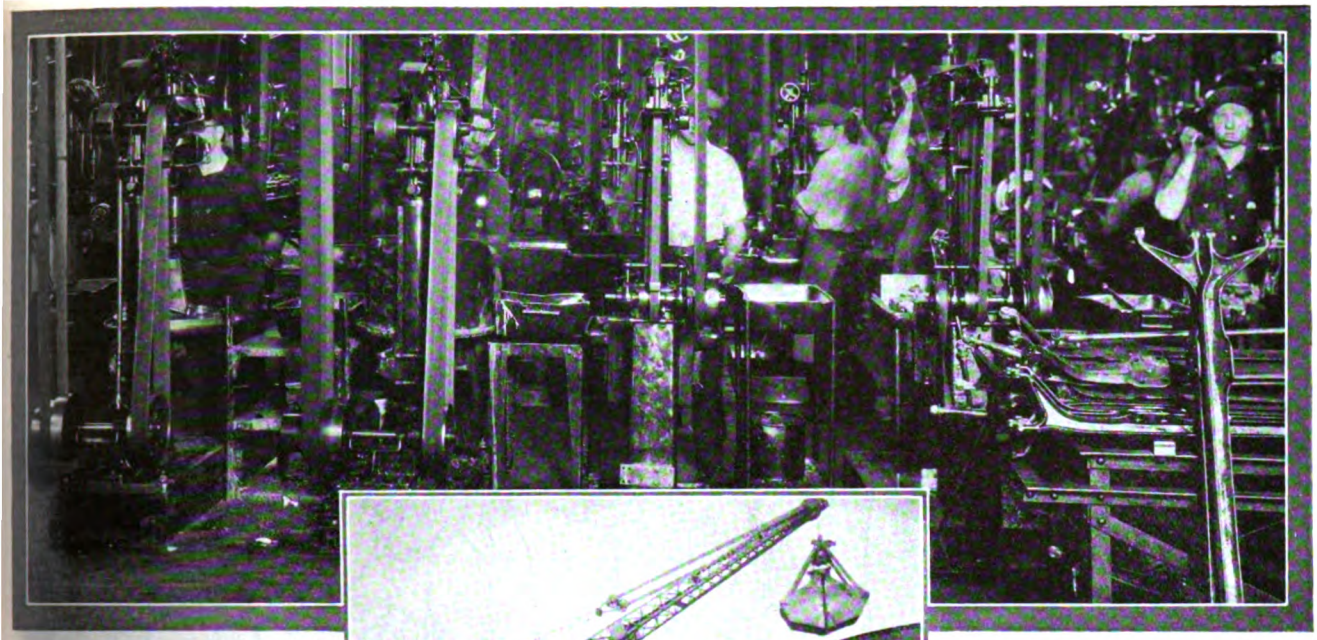


Fig. 8. In many of the production lines in the different plants, parts are passed from machine to machine by the operators, using the metal boxes shown.

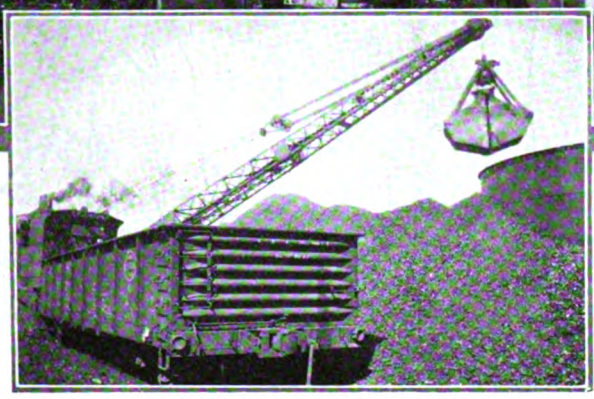


Fig. 9. All reserve fuel at the different power plants is handled by such equipment as this.

parts. When full, they are pushed along to the shipping platform to be covered and marked. Lift-trucks are used to a considerable extent in this plant where the material is handled in stacks, as shown in Figs. 10 and 11.

In Conclusion

The process of manufacturing automobiles on such a scale as the Chevrolet production of 25,000 cars a week is necessarily such that conveyors can be used to the greatest advantage. The flow of materials is continuous and the parts, with few exceptions, are comparatively light. These are the ideal conditions for economic handling by conveyor. A brief glance through the preceding articles reveals the fact that the conveyor is the backbone of the handling system in all the plants.

Conveyors are supplemented by travelling cranes, mono-rails, lift-trucks and tractors, where they are better able to do the work required than conveyors would be.

The principle followed is the unquestionably sound one that the method of transportation to be applied in any given case is that which comparative analytical studies have shown to be the most direct and economical. For that very reason these articles are in the nature of a practical treatise on methods which have proved themselves successful.

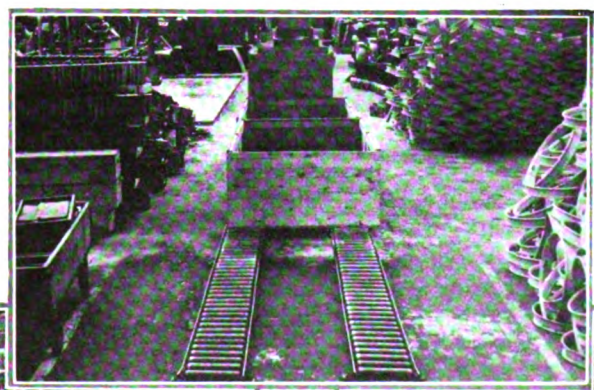
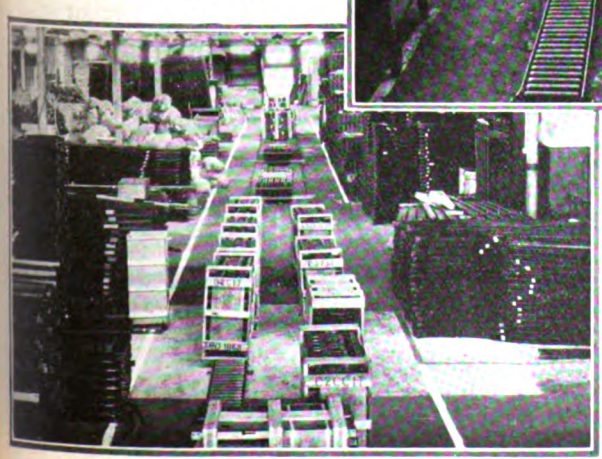


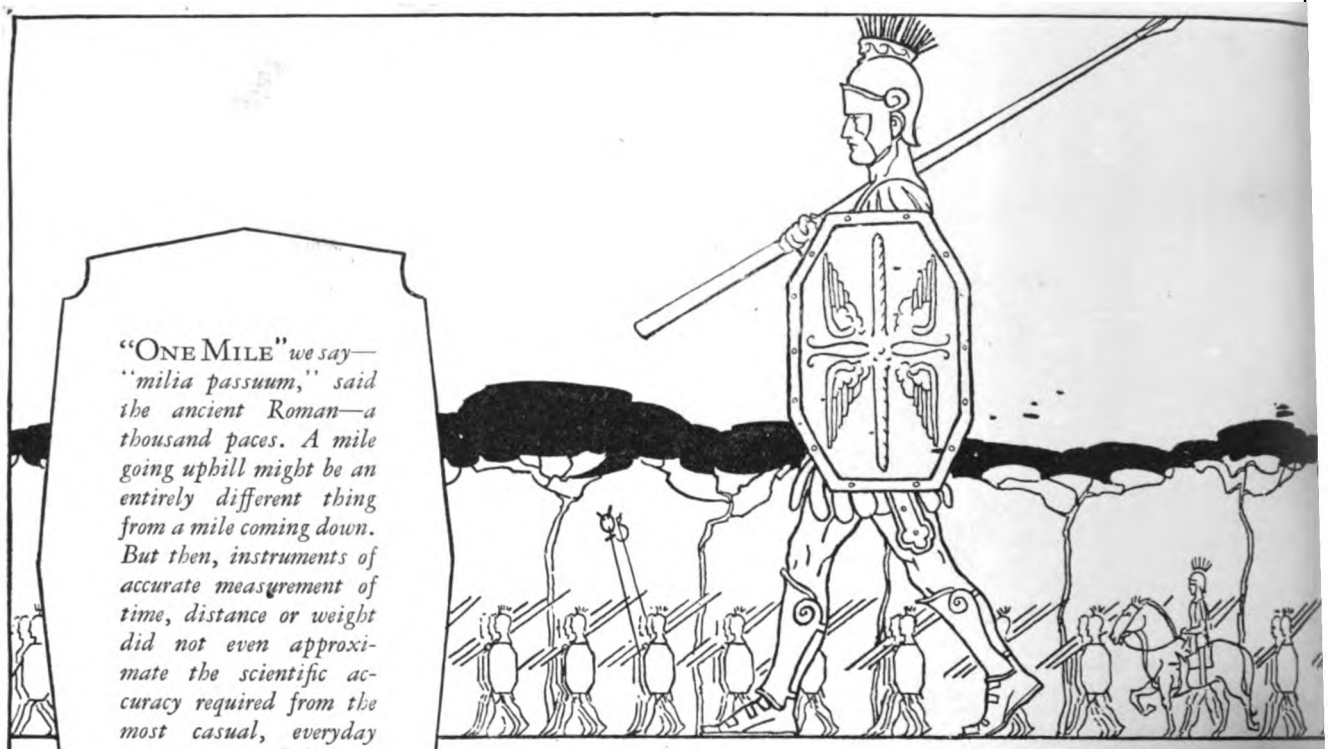
Fig. 11. Another view in the export plant showing the use of lift-truck skids for handling parts of shipping crates.

Fig. 10. In the export plant at Bloomfield, N. J., crates of materials are handled on roller conveyors as shown in the two views at the right and below.





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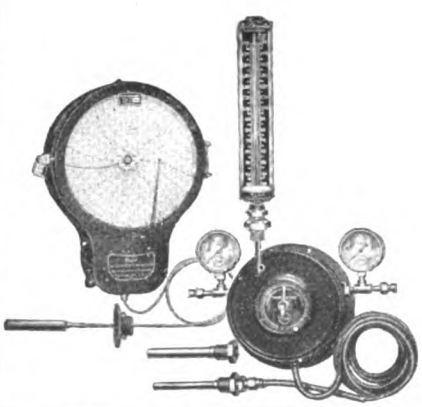
"ONE MILE" *we say—"milia passuum," said the ancient Roman—a thousand paces. A mile going uphill might be an entirely different thing from a mile coming down. But then, instruments of accurate measurement of time, distance or weight did not even approximate the scientific accuracy required from the most casual, everyday measurements of the present.*

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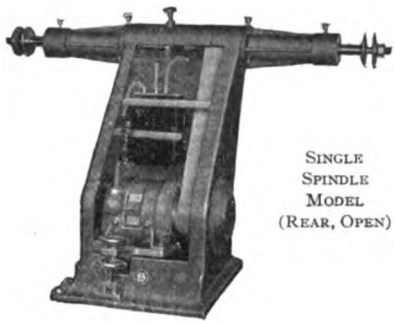
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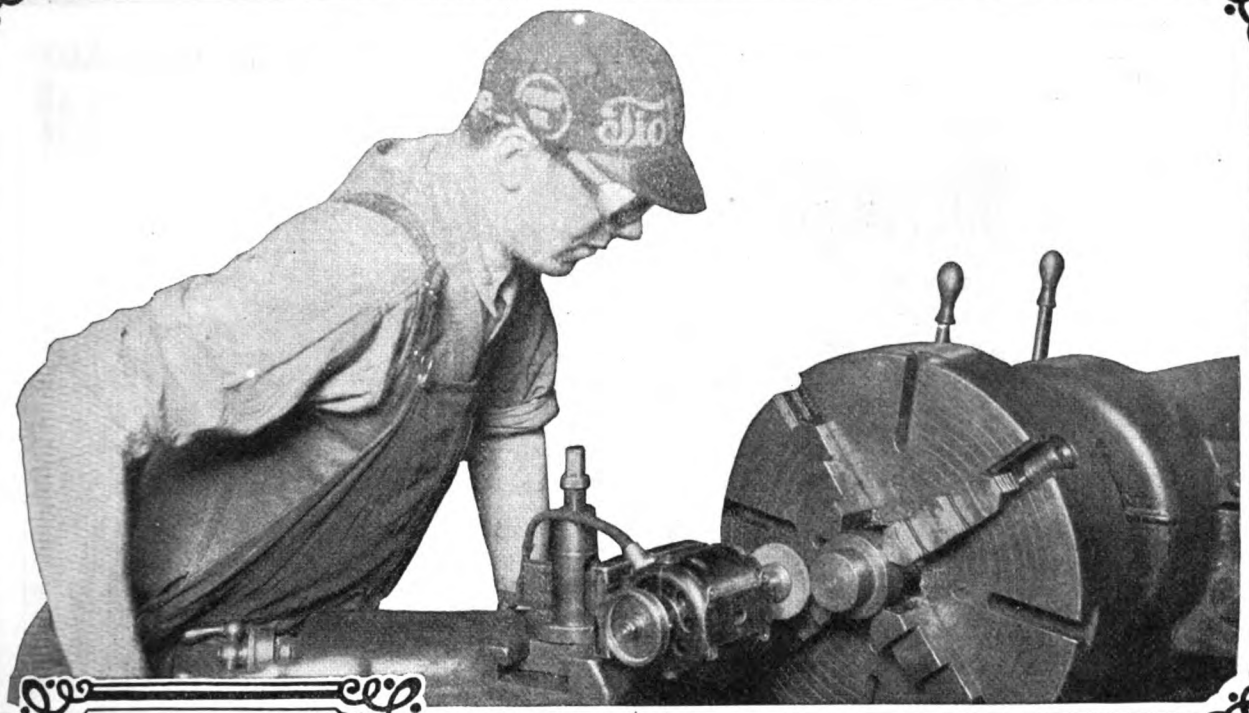


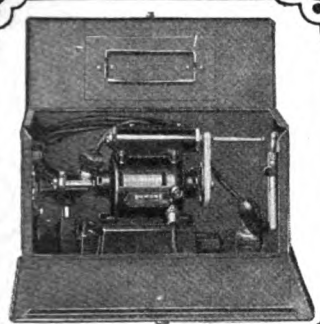
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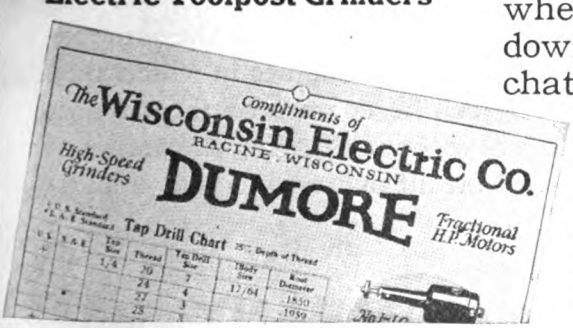
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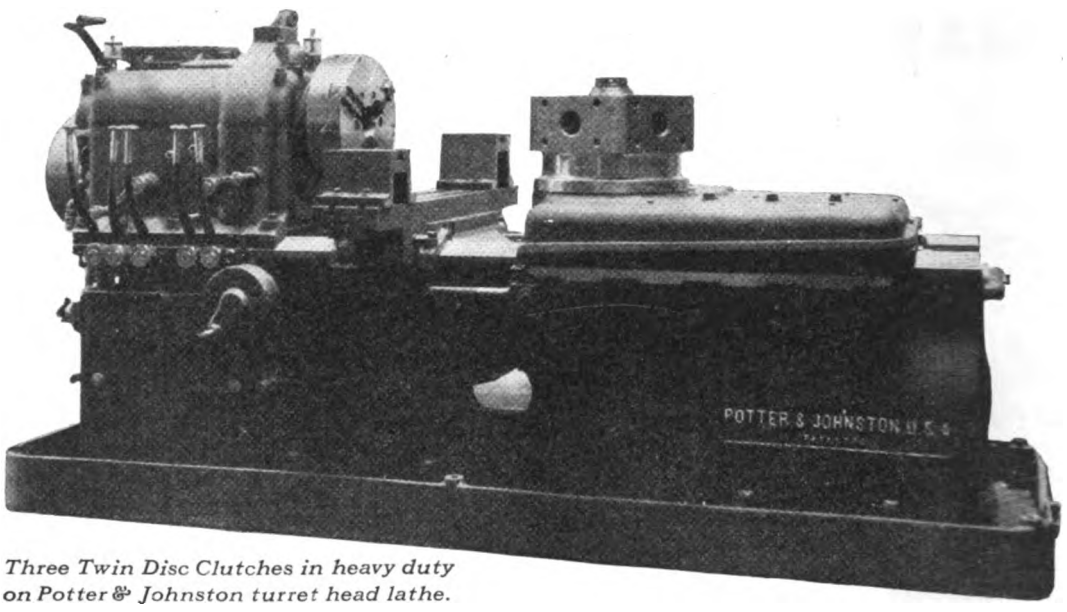
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The Dollars and Sense of Mechanical Handling

PROGRESSIVE management has learned that profits are not to be found in higher prices or lower wages. High prices restrict the market; low wages restrict buying power. The source of increased profits, today, lies in finding new economies.

Economy is not a mere matter of cutting down expenditures. The expenditure of one thousand dollars for equipment which yielded no return on the investment, would be extravagance; but the expenditure of fifty thousand dollars for equipment which will, in operation, pay for itself many times over, constitutes a real and highly profitable economy.

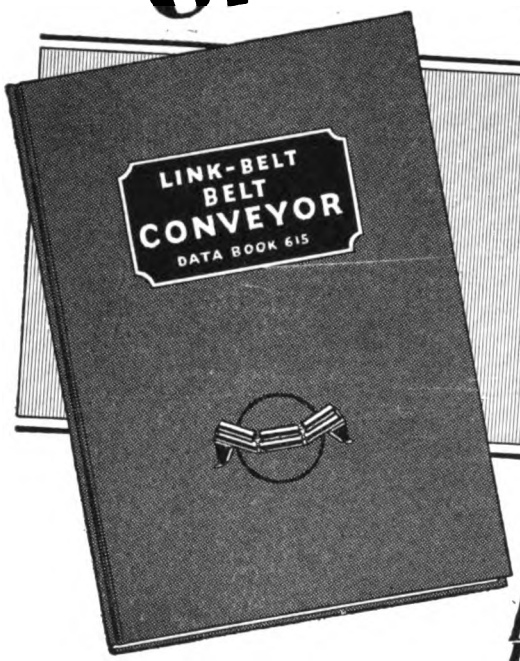
That is why mechanical methods of handling materials have made such rapid strides in the past decade. That is why the most efficient industry in this country today—the automotive industry—is also the outstanding example of modern methods of materials handling. Because the lifting, moving and handling of raw materials, parts, and finished product constitute such a large part of the total cost of production, that economies attainable are in proportion.

The following pages contain information on a wide variety of equipment designed to reduce the cost of handling materials. To the man whose plant is still laboring under the handicap of excessive handling costs, these pages should be a source of inspiration. To the plant manager who is ever on the lookout for practical ways to reduce costs, a study of these pages will inevitably lead to profitable ideas.

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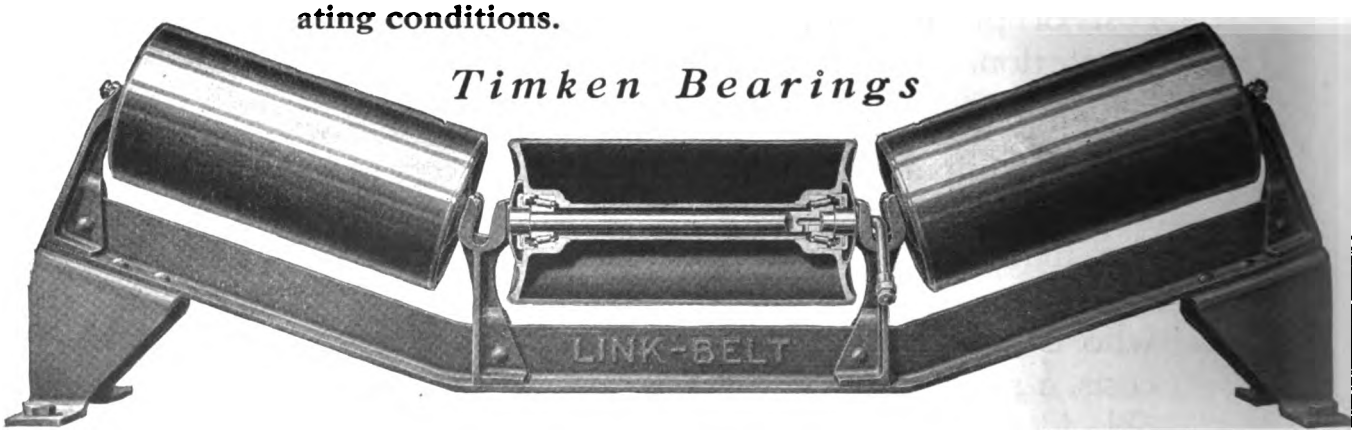
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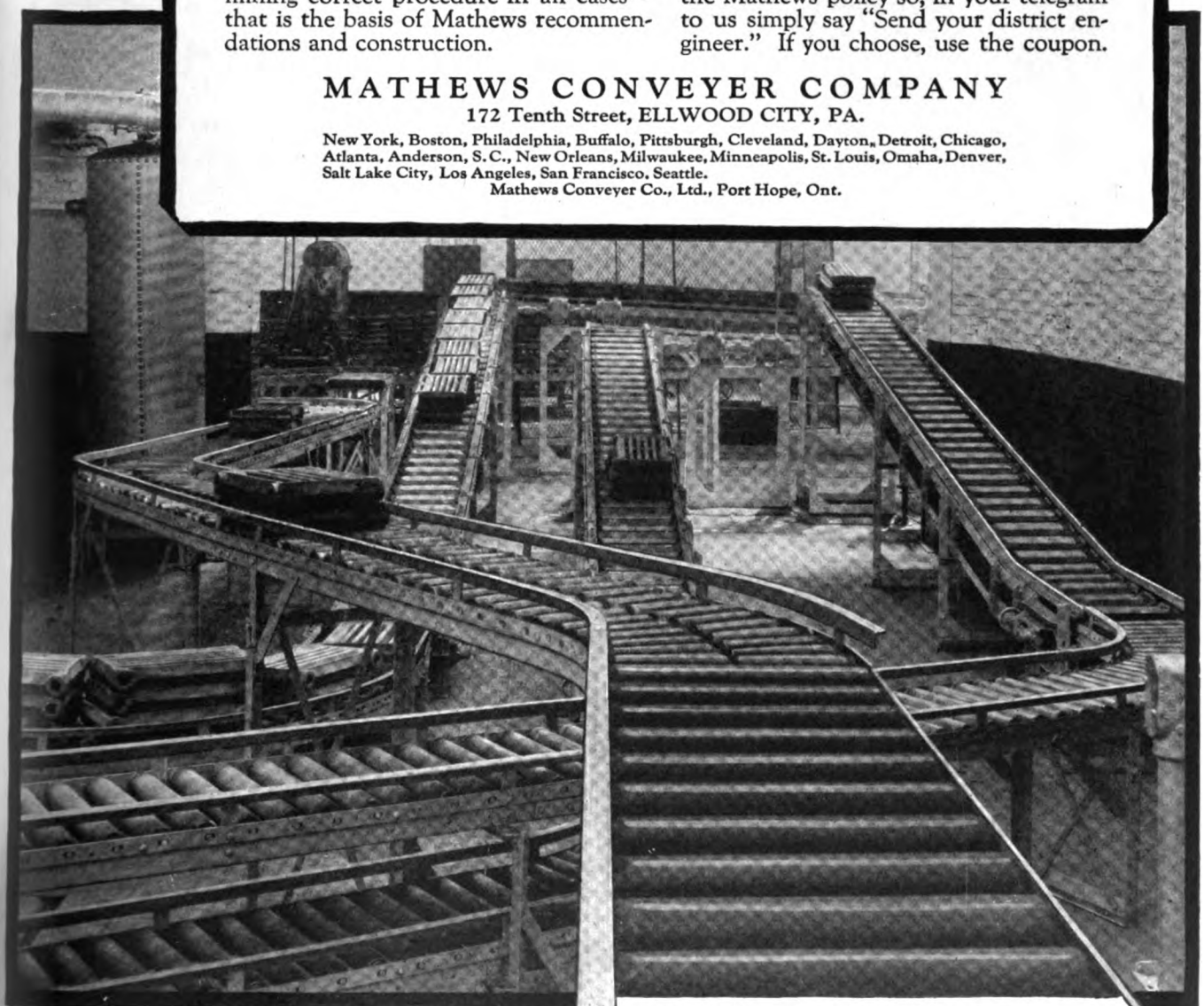
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New York, Boston, Philadelphia, Buffalo, Pittsburgh, Cleveland, Dayton, Detroit, Chicago, Atlanta, Anderson, S. C., New Orleans, Milwaukee, Minneapolis, St. Louis, Omaha, Denver, Salt Lake City, Los Angeles, San Francisco, Seattle.
Mathews Conveyer Co., Ltd., Port Hope, Ont.



MATHEWS
Conveyer Systems
Increase Plant Profits

MATHEWS CONVEYER COMPANY
172 Tenth Street, Ellwood City, Pa.

Send your district engineer to talk over our possible use of a Mathews Conveyer System.

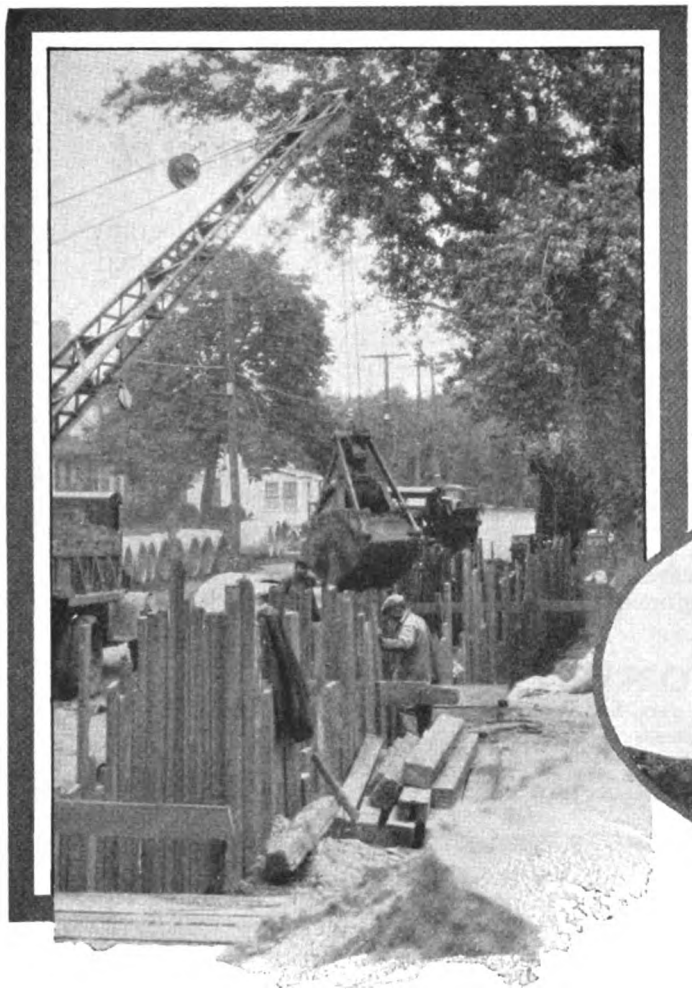
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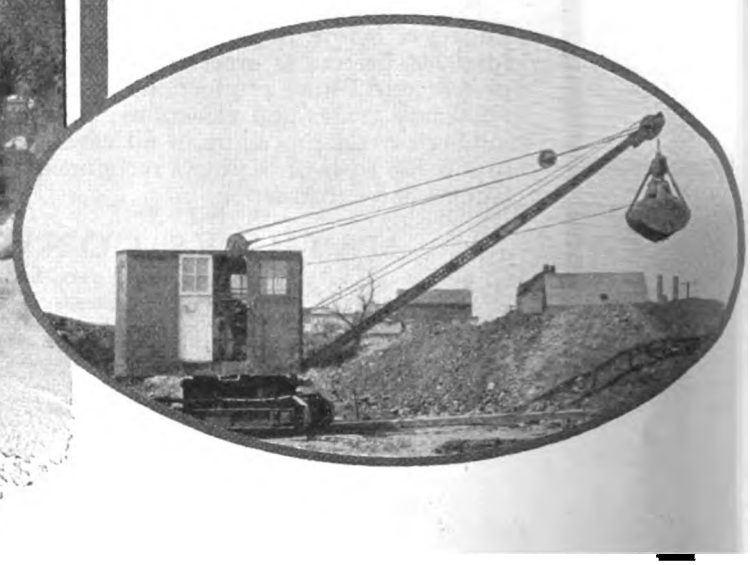
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Brownhoist Products

Heavy Dock Machinery, Locomotive Cranes, Monorail Trolleys, Concrete Bunkers, Gas Shovels, Chain Conveyors, Belt Conveyors, Bridge Cranes, Coal Crushers, Buckets, etc.



5 Brownhoist Clamshells on $2,500,000 Sewer Job

• An arm is no stronger than its hand, and no crane can pick up a bigger load than its bucket will bite. On this basis a large contracting company of New York proved to themselves, on their Long Island sewer job, that their choice of Brownhoist buckets was justified.

The five buckets were used chiefly for excavating the trenches for the pipe. The cuts were from 12 to 14 feet deep in hard packed material, but the clamshells, equipped with teeth, handled the job without stalling. Each bite meant a capacity load and was one of the reasons why the above company finished the contract before schedule time.

If there is a bonus clause in your contract it will pay you to use Brownhoist Clamshells. They stick to the job until it's finished and enable you to earn those extra profits your competitor often brags about. Send for Booklet 277 which describes the different types.

The Brown Hoisting Machinery Co., *Cleveland, O.*

Branch Offices: New York, Chicago, Pittsburgh, New Orleans, San Francisco and St. Louis.

BROWNHOIST
Clamshell Buckets

Coupon →

We are interested in further information and prices on a Brownhoist Clamshell of ½-yd.__ ¾-yd.__ 1-yd.__ 1½-yd.__ 2-yd.__ capacity for use on a _____ to handle _____

Name _____

Street _____

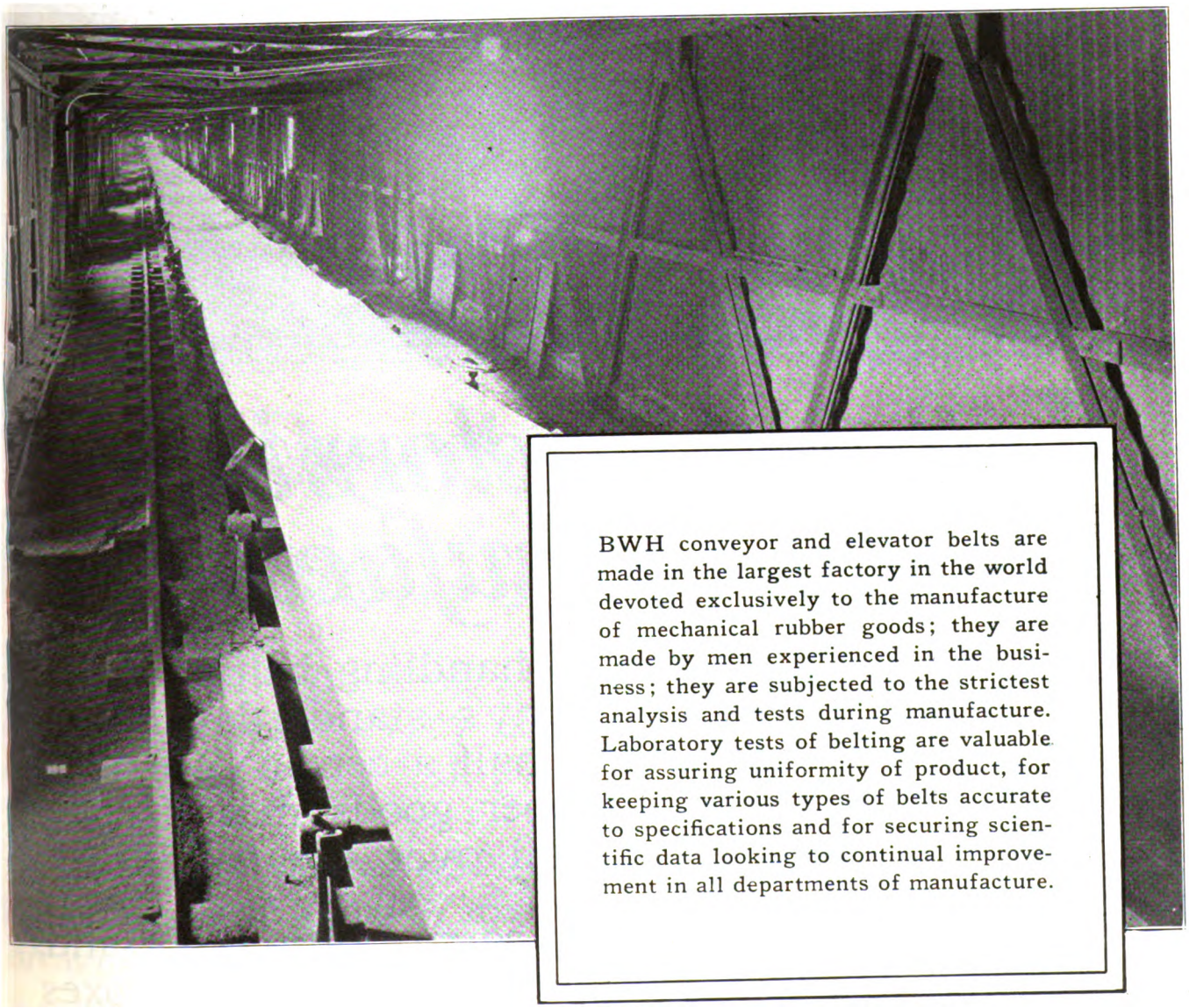
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BELTING

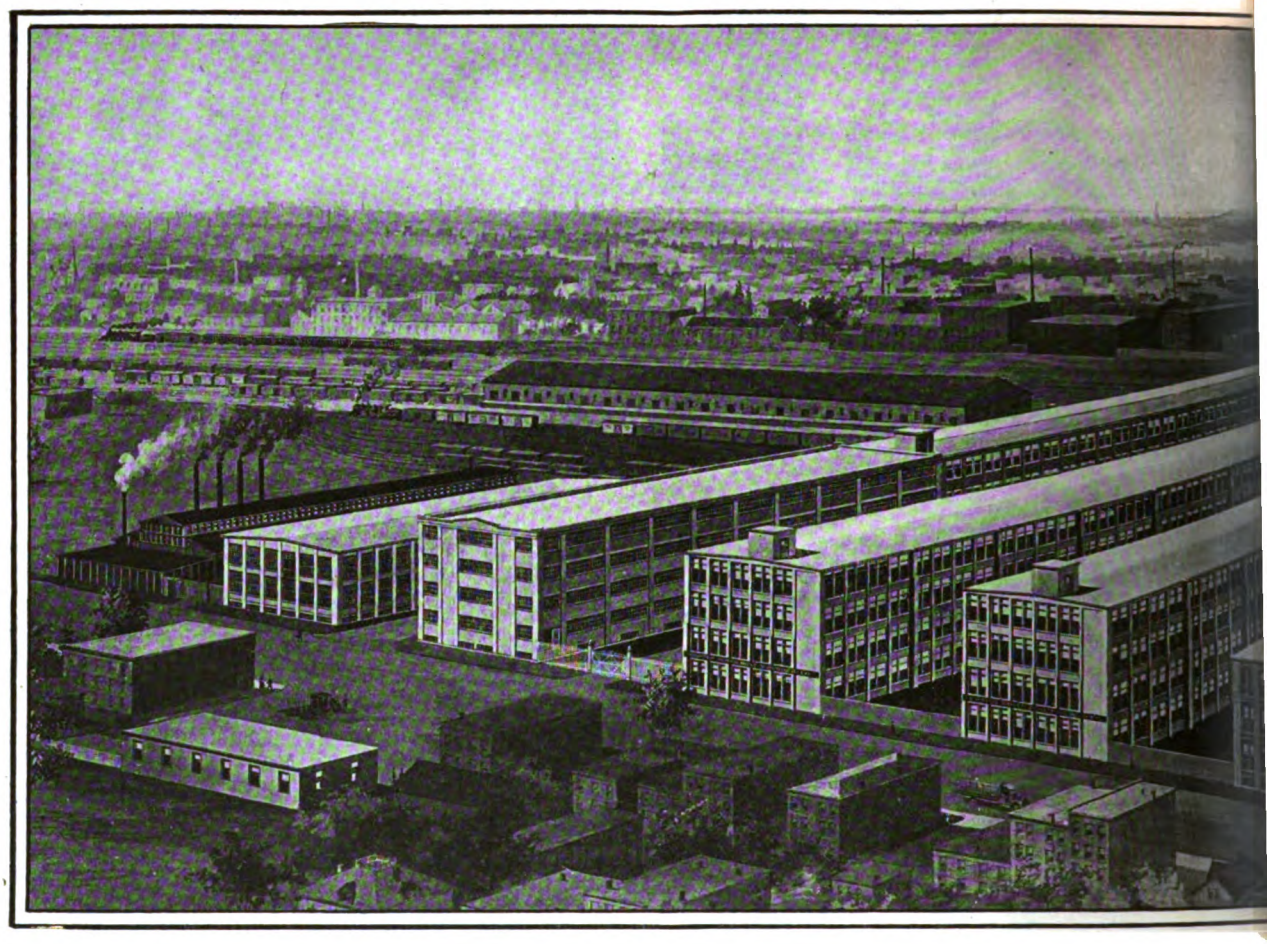
Built to Lower Materials Handling Costs



BWH conveyor and elevator belts are made in the largest factory in the world devoted exclusively to the manufacture of mechanical rubber goods; they are made by men experienced in the business; they are subjected to the strictest analysis and tests during manufacture. Laboratory tests of belting are valuable for assuring uniformity of product, for keeping various types of belts accurate to specifications and for securing scientific data looking to continual improvement in all departments of manufacture.

BOSTON WOVEN HOSE & RUBBER CO., CAMBRIDGE, MASS.

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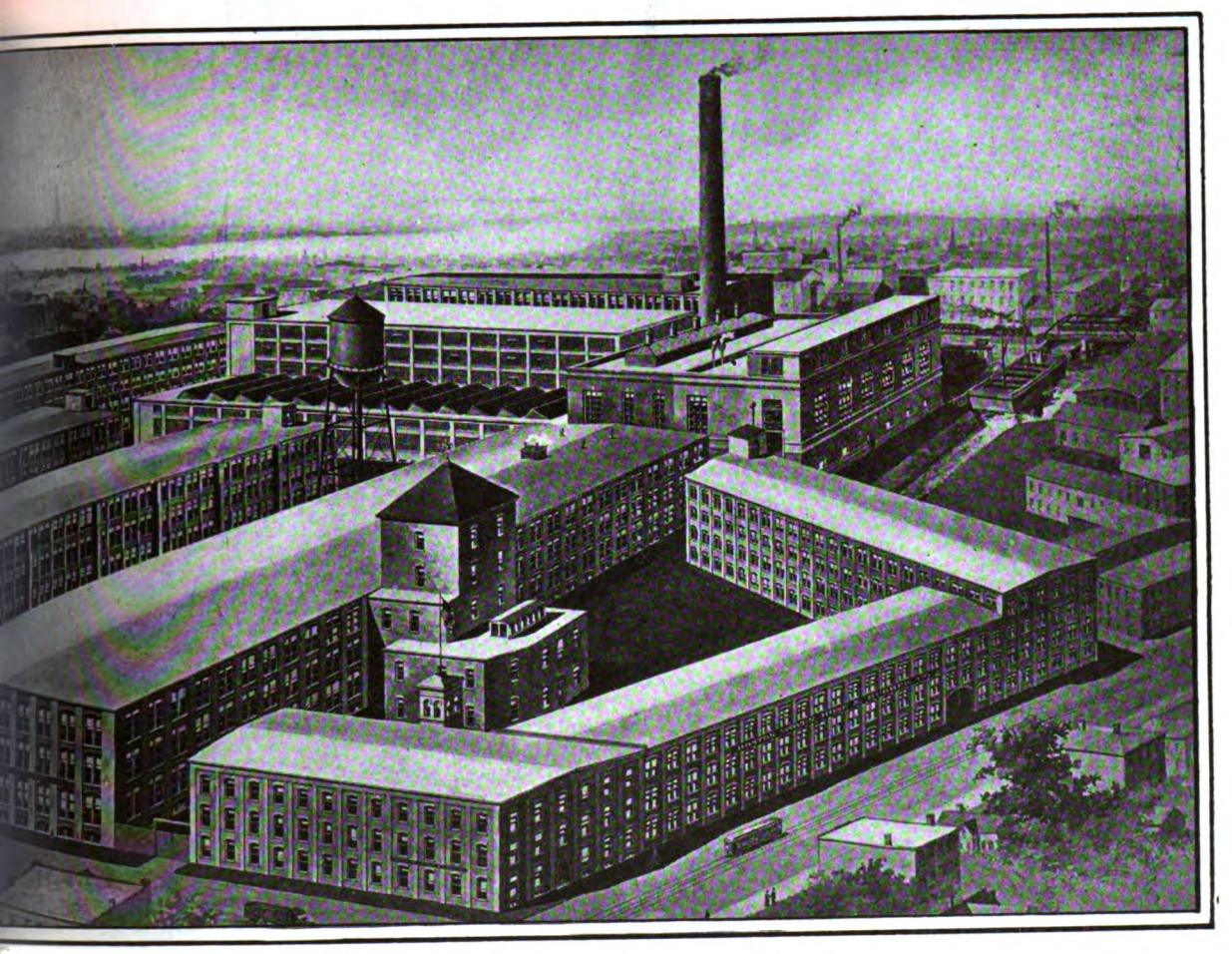
Largest Factory in the to the Manufacture of

Conveyor and materials handling belting made to B. W. H. & R. Company's standards and resulting from more than half a century's experience in mechanical rubber goods manufacture may be found in use all over the world.

B. W. H. Conveyor belts carry grain, coal, sand, rocks, ore, gravel, hot substances, barrels, boxes

BOSTON WOVEN HOSE & RUBBER

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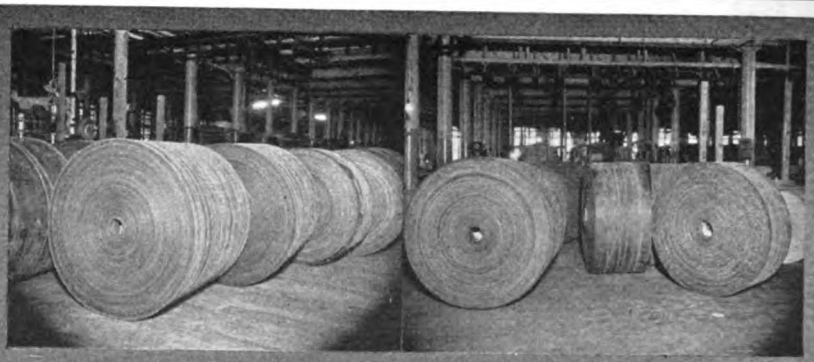
World Devoted Exclusively Mechanical Rubber Goods

and are found on long and short travel conveyors, and in fact every service for which a belt conveyor may be adapted.

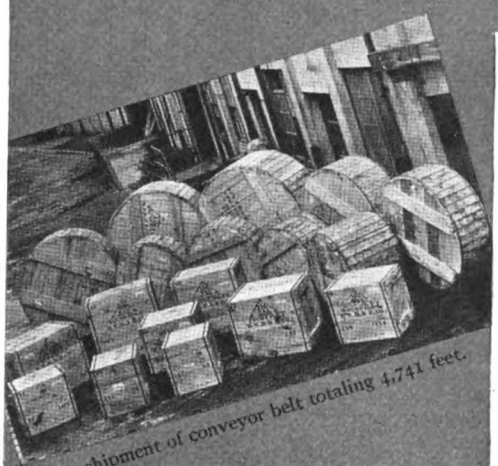
In the study of transmission and conveying problems we have learned many truths, the application of which to your business is part of the service we will consider it a privilege to offer you.

CO., CAMBRIDGE, MASS.

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Conveyor belts shipped 1926 to Chili for nitrate fields.



$10,000 shipment of conveyor belt totaling 4,741 feet.



Coal conveyor belt 600 feet long, 60 inches by 9 ply.

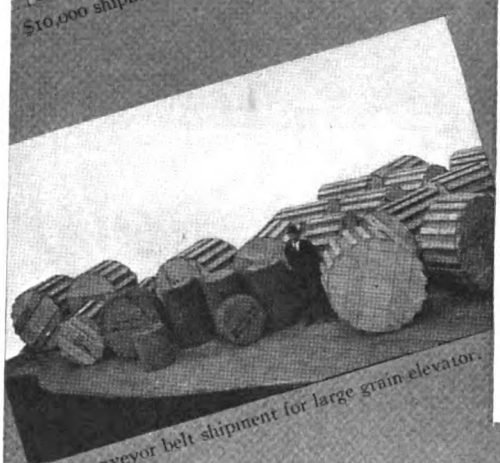
The real test of a conveyor or elevator belt is its actual use for a time long enough to demonstrate its behavior and life under the mechanical, physical and chemical conditions to which it is subjected.

For this reason, B.W.H. engineers make a constant study of various belting industries in order to keep abreast or in advance of the needs of the times. We are ready at all times to cooperate with you to recommend the particular belt that is best suited to your work.

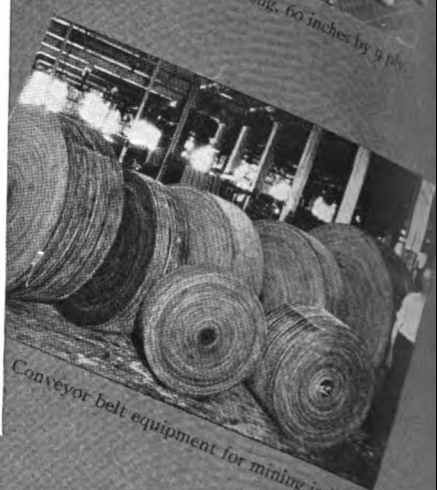
No two conveyor or elevator jobs are exactly alike, so that good practice in one may be bad practice in another. What you want is economical service free from trouble. You can get it in BWH belts with the help of our best experts.

Boston Woven Hose & Rubber Co.

Cambridge, Mass.



Part of conveyor belt shipment for large grain elevator.

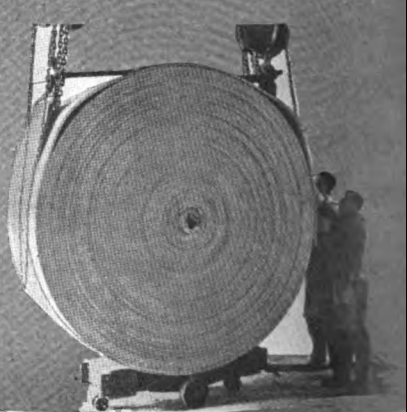


Conveyor belt equipment for mining industry in Peru.



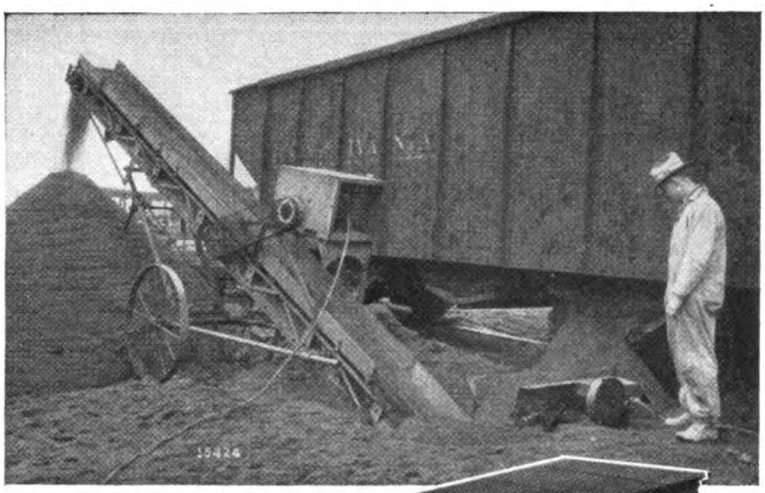


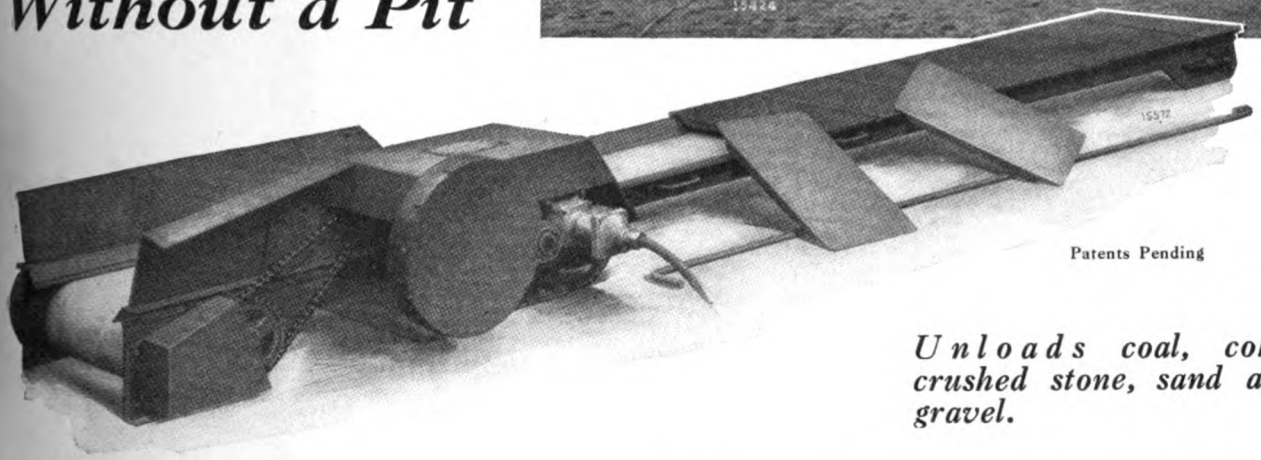
Above—Elevator belt for one of America's largest copper mines.
Right—Coke conveyor belt ready for shipment.
Left—Another huge belt for the Chilean nitrate fields.



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The X-TRACK-TOR Unloads Hopper Bottom Cars Anywhere Without a Pit





Patents Pending

Unloads coal, coke, crushed stone, sand and gravel.

WHEN your sand and gravel cars come in, the Jeffrey X-TRACK-TOR Car Unloader will unload them anywhere in the yard at the rate of a-ton-a-minute and the sand flows out as smoothly as from the valve of a silo, dropping onto the end of your portable conveyor for piling or trucking.

You need no concrete loading pit built under the track to load onto your portable conveyor. The Jeffrey X-TRACK-TOR takes the place of a loading pit.

The X-TRACK-TOR slides on top of the rails under the hopper bottom car. Its height above the rail is less than three inches and it works under the lowest hopper.

The Jeffrey X-TRACK-TOR allows you to make a storage pile the entire length of your yard.

Write for the bulletin describing the Jeffrey X-TRACK-TOR Car Unloader.

The Jeffrey Manufacturing Company
946-99 North Fourth St., Columbus, Ohio

New York, Buffalo, Rochester, N. Y., Philadelphia, Pittsburgh, Scranton, Pa., Boston, Cincinnati, Cleveland, Detroit, Chicago, Charleston, W. Va., Milwaukee, St. Louis, Denver, Salt Lake City, Los Angeles, Birmingham, Charlotte, N. C., Montreal

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JEFFREY COAL MINE EQUIPMENT

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Lift the fog from plant operations

IT ISN'T lower sales figures, nor less advertising nor anything else that will help meet the super-competition of the future.

It's lower operating costs.

Dust is one of the objectionable features in all plants—make your plant a dustless plant by installing a modest priced Dracco System.

Not only that, but the Dracco System can help in reducing the costs of material handling. Dracco Pneumatic Conveying lines adapted to the handling of your particular materials—lime, gypsum, litharge, soda ash, sand, cement, chemicals, reduces your problem to an amazingly simple and inexpensive operation.

There is no waste—no clogging—no delays—no complicated apparatus and no manual labor.

Our engineers can show you some interesting figures on savings accomplished in plant operations of other companies. They demand your interest, so send for pamphlets.

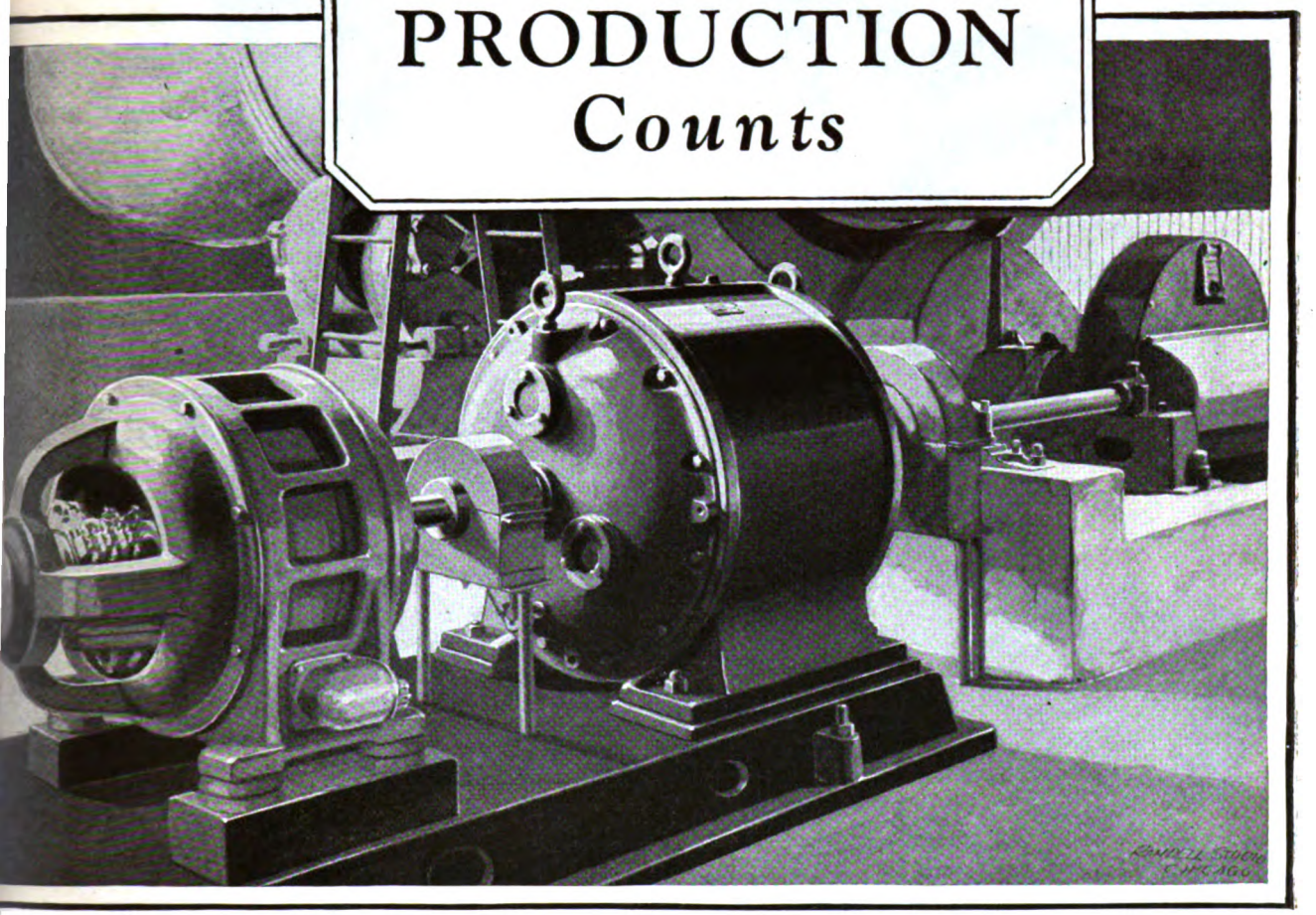
Dust Recovering & Conveying Co.
Harvard Avenue and East 116th Street
Cleveland, Ohio

DRACCO DOES IT

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Where CONTINUOUS PRODUCTION *Counts*



In this large Portland Cement Company, the mechanical equipment of which is perhaps unsurpassed, close to a hundred Jones Spur Gear Speed Reducers are driving conveyors, elevators, kilns, coolers and other slow moving machines.

Continuous production must be maintained on an economical basis. Therefore the preference of this company's manufacturing executives is for Jones Speed Reducers. Actual experience with many types of reducers has segregated Jones Reducers from the rest for reliability and economy.

Installation is simple and costs less than other methods of stepping down motor speeds. The motor and reducer come mounted on the same cast-iron base. Perfect alignment is assured. The balanced straight line drive conserves power. Exposed belts, gears and chains, so menacing to workmen, are eliminated. The reduction gears are inside a dust-proof housing. They operate in an oil bath—under ideal conditions. No attention is required other than occasional refilling of the oil chamber.

The lowered costs of installation, of transmitted power, of upkeep, of space and safety quickly repay the initial investment in Jones Speed Reducers.

Jones Speed Reducers

W. A. Jones Foundry & Machine Company

Main Offices and Works: 4412 West Roosevelt Road, Chicago

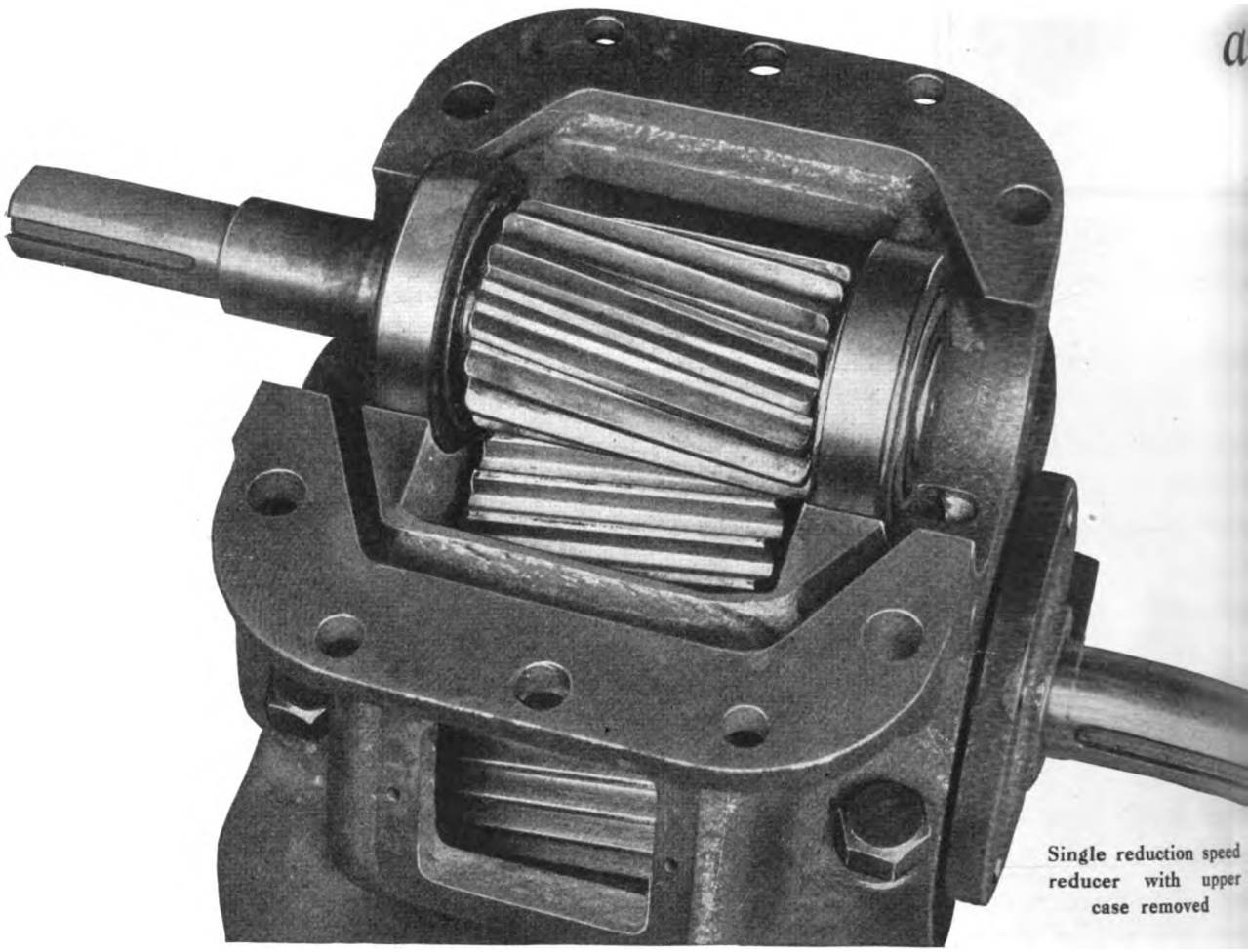
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For Smoother, More Efficient Operation



Single reduction speed reducer with upper case removed

Nuttall Helical Gear Speed Reducers with Timken Tapered Roller Bearings

These Nuttall helical gear speed reducers are particularly adaptable for heavy handling equipment. Few parts to get out of order, built to operate continuously with no attention beyond occasional lubrication.

Single helical gears give a smooth, vibrationless operation with high mechanical efficiency. The great tooth strength and superior wearing qualities and their ability to resist external thrust have influenced their choice by many manufacturers of handling equipment as well as industrial users.

Nuttall speed reducers are available with maximum ratios of 8 to 1 in single reductions, and ratios of 47 to 1 in double reductions.

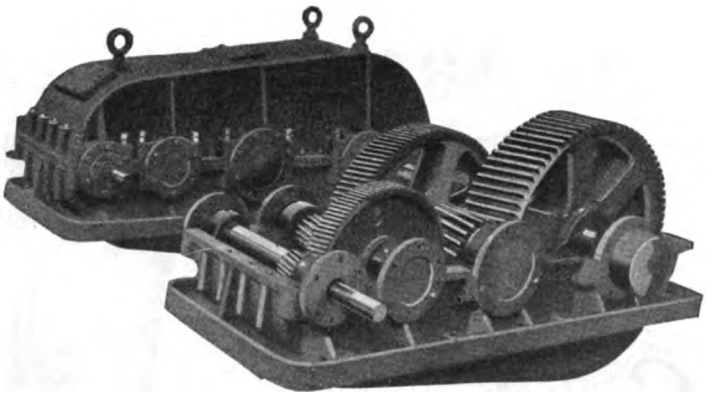
Send for Speed Reducer Bulletin.

Nuttall

For products not ... issue ... Industry Illustrated

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ndling Equipment her Machinery



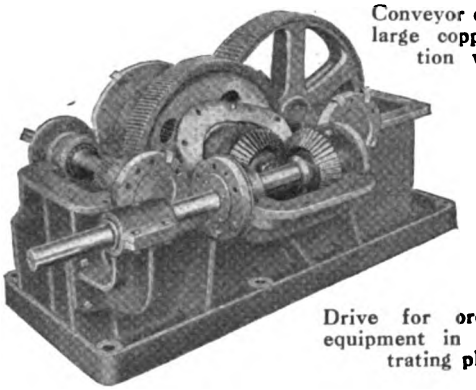
Conveyor drive for a large copper reduction works.

uttall Speed Reduction Units fit right into odern production schedules and the demand r efficient handling methods.

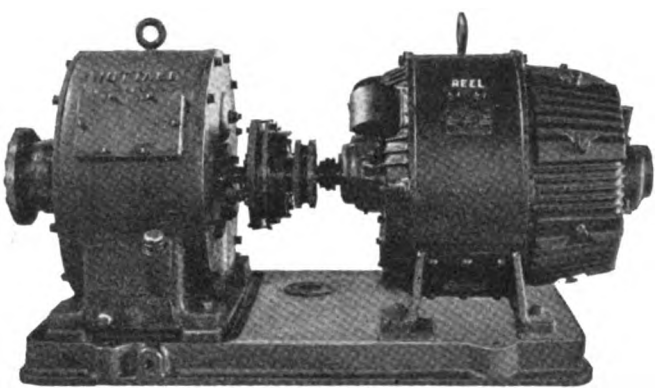
uttall Gear Units cannot help but give the rvice required because they are quality roducts, built of the best materials available. Whether your needs call for Nuttall vibraionless helicals, herringbones, spurs or bevels, ll are accurately cut on modern machines by xperienced workmen.

A complete heat treating department is in harge of men who have made gear steel reating their life work. The Nuttall BP "Tough Hard" Special process will raise the ardness of a 40-50 carbon steel gear four imes and triple its impact resistance. We bsolutely guarantee it to give four times the ife of untreated gears in similar service.

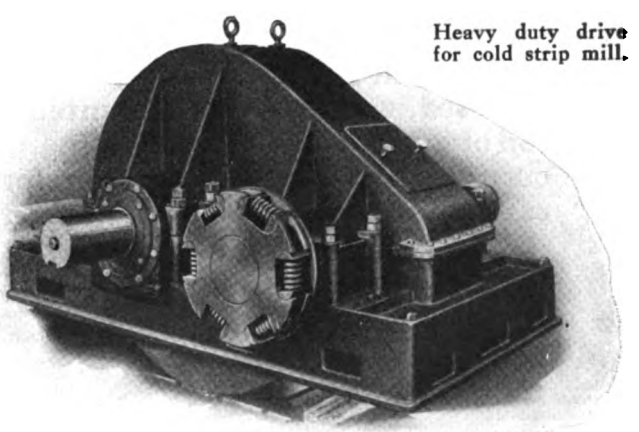
Machine shut-downs are costly. Insure gainst them with Nuttall BP Gears.



Drive for ore feeding equipment in a concentrating plant.



Speed reducer for driving the Reel in a paper mill.



Heavy duty drive for cold strip mill.

R. D. Nuttall Company
Pittsburgh, Pa.

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Lyman Tube and Supply Co., Montreal, Canada

Reduction Gear Units

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AN outstanding design of speed reduction unit in which are embodied many desirable features not found in any other Speed Reducer.

It is a self-contained unit entirely enclosed, with a motor mounted on top of a very substantial housing. It occupies little space, and, therefore, can be installed in narrow quarters, where it would be impossible to accommodate some other types of Reducers.

Here is a typically Caldwell product—tried and proved, priced right—the kind of Speed Reducer you have been looking for.

Write today for our new Catalog No. 630 which gives full particulars.

C-100

H. W. CALDWELL & SON CO.

LINK-BELT COMPANY, OWNER

CHICAGO:—Western Avenue at 17th and 18th Streets

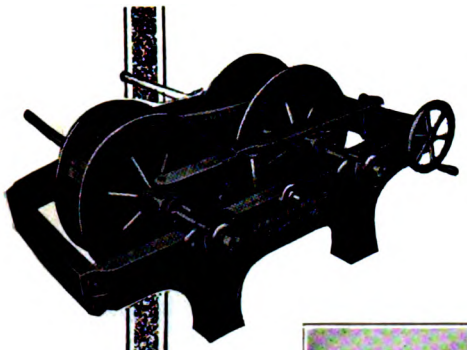
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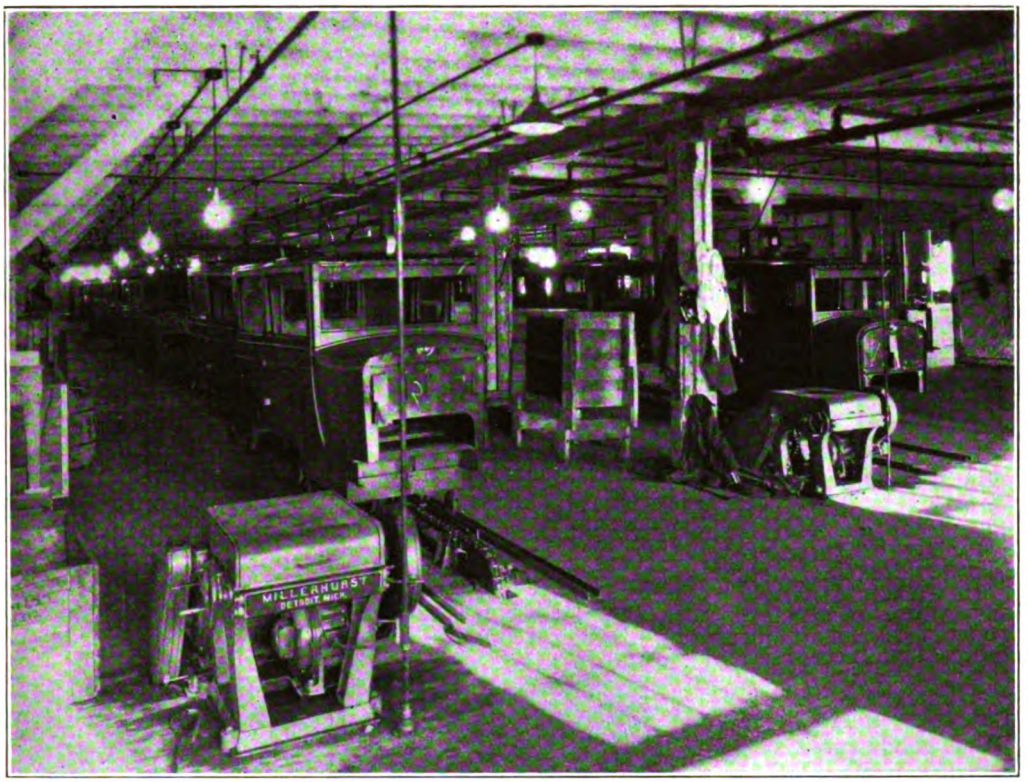
CALDWELL

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An Increase in Production of 270 Per Cent



This Miller-Hurst Power Unit in the Plant of the Hays Ionia Company, Grand Rapids, Michigan, conveys automobile bodies. The continuous operation of this unit has increased the capacity of the body trim shops 270%.

LEWELLEN Transmissions drive this power unit and are responsible in no small measure for this efficiency, by maintaining an absolutely uniform speed control, with no shut downs for repairs or breakage.

LEWELLEN Transmissions give accurate control of speed on many conveyors and other handling units, maintaining the required speed to a fraction of an R. P. M. They do not jerk and speeds can be varied from fast to slow and slow to fast, whenever required.

Many such applications are illustrated in our catalog. Write for a copy.

There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN Variable Speed TRANSMISSION

LEWELLEN MFG. CO., 1300—10th STREET, COLUMBUS, IND.

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Your Business Is No Exception

The machines in your plant need speed flexibility just as much as your competitor's

By G. L. REEVES
President, REEVES PULLEY COMPANY
Columbus, Indiana

DETROIT BOOTH 361

YOU MAY have special processes and may use special machinery in your production—but when it comes to speed flexibility, your business is no exception. Speed flexibility is VITAL! It is the basic factor in every production method.

Because, all production is a matter of *time*. In the baking industry, it is the *time* of the loaves going through the ovens—in the textile industry, it is the *time* of the goods going through the finishing lines—in the automobile industry, it is the *time* of the assembly conveyors—and so it is in your industry and every industry. It is *time* that is the basic production factor.

Not necessarily the *fastest* time—but the most *efficient* time to meet the particular condition which has arisen that day or that hour. In baking, the weather and the type of loaf determine the time—in textile mills, some goods must be finished slower than others—in automobile plants, the day's production schedule and the number of men on the line determine the speed of the conveyors.

Time and *speed*—they are synonomous—because, when you change the speed of a machine, you change its production time. So, to be able to give your product *always* the exactly proper *time in production*, your production machinery must be absolutely *flexible in its speed*.

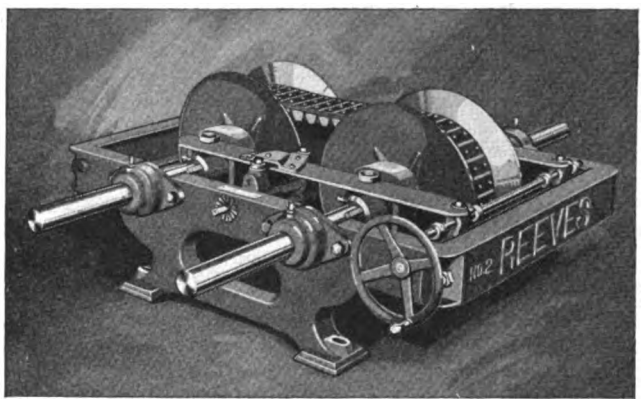
In *your plant*, every material change, every schedule change, or any other difference in operating conditions, demands a change in the speed of some particular unit of your machinery. There is *one best speed* for every operation under every different operating condition—and without speed flexibility it is impossible to maintain that one best speed.

We have assembled valuable information from our association with other manufacturers in your industry. We have collected intensely interesting figures on the advantages and economies which speed flexibility has brought them. We want you to have these figures and this information—because, your business is no exception. You need speed flexibility just as much as your competitors. And speed flexibility will bring you greater production efficiency, and will save tremendously on your production and labor costs.

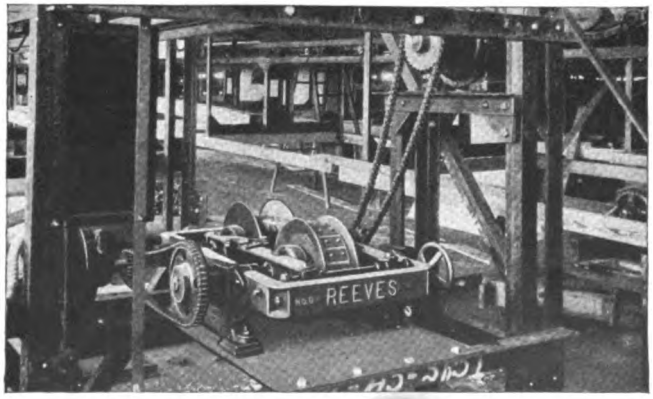
The REEVES Variable Speed Transmission represents the only method which will give you *absolute* speed flexibility. Ordinary speed changing devices give just *steps* in speed, but steps are not *exact* enough for good results. Often the speed you need is *between* the steps, and the REEVES Transmission in the only way of getting the "in-between" speeds accurately.

You get literally *millions of speeds* with the REEVES—*any* speed between fastest and slowest, even to the smallest fraction of a revolution. It is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed you desire to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to suit any different operating condition.

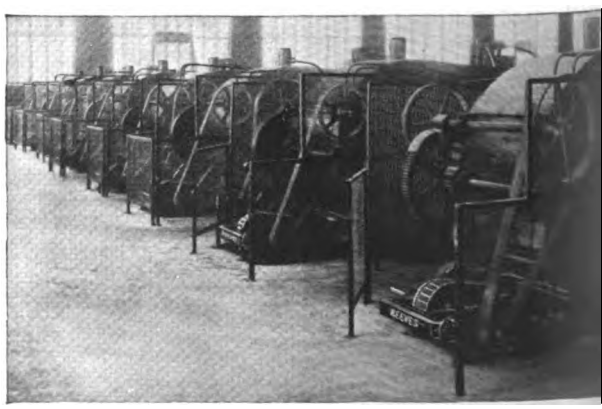
Inexpensive and easy to install, simple to operate, accurate and dependable *always*. You can get *any* speed at *any* time on *any* machine that is REEVES equipped. Send for catalog H-66 and facts about the REEVES in *your own industry*.



The REEVES Variable Speed Transmission



The REEVES Transmission giving sp ility to an oven conveyor for wheels at the Packard M . Detroit, Mich.



Eight REEVES Transmissions controlling the speed of a group of Baker Perkins sugar wafer ovens in a Davenport, Iowa, bakery

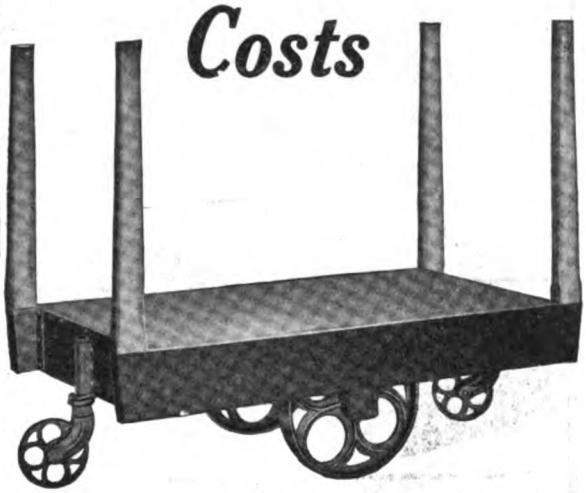
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5-ton Heavy Duty Truck
Roller Bearing Throughout

Globe Trucks Cut Production Costs



Size 24 x 52
All Steel One-Piece Unit
Roller Bearing

Many plants are now standardizing Globe Trucks because performance records prove that they cut production costs.

They are *built stronger to last longer* and the experience of years of service in handling and transporting all sorts of shop materials and products has resulted in the incorporation of many patented features which add to their long life and exceptional service.

They cost no more than ordinary trucks, so why not buy *Globe Trucks* instead of those without any guarantee of service. GLOBE TRUCKS are built in both wood and steel.

Our Engineering Department can assist you materially in the selection of the type of truck to cut your costs of handling and moving materials.

Complete catalog, discount sheet and special information on request. Get all the facts.

You Can't Go Wrong on a Globe

GLOBE TRUCKS

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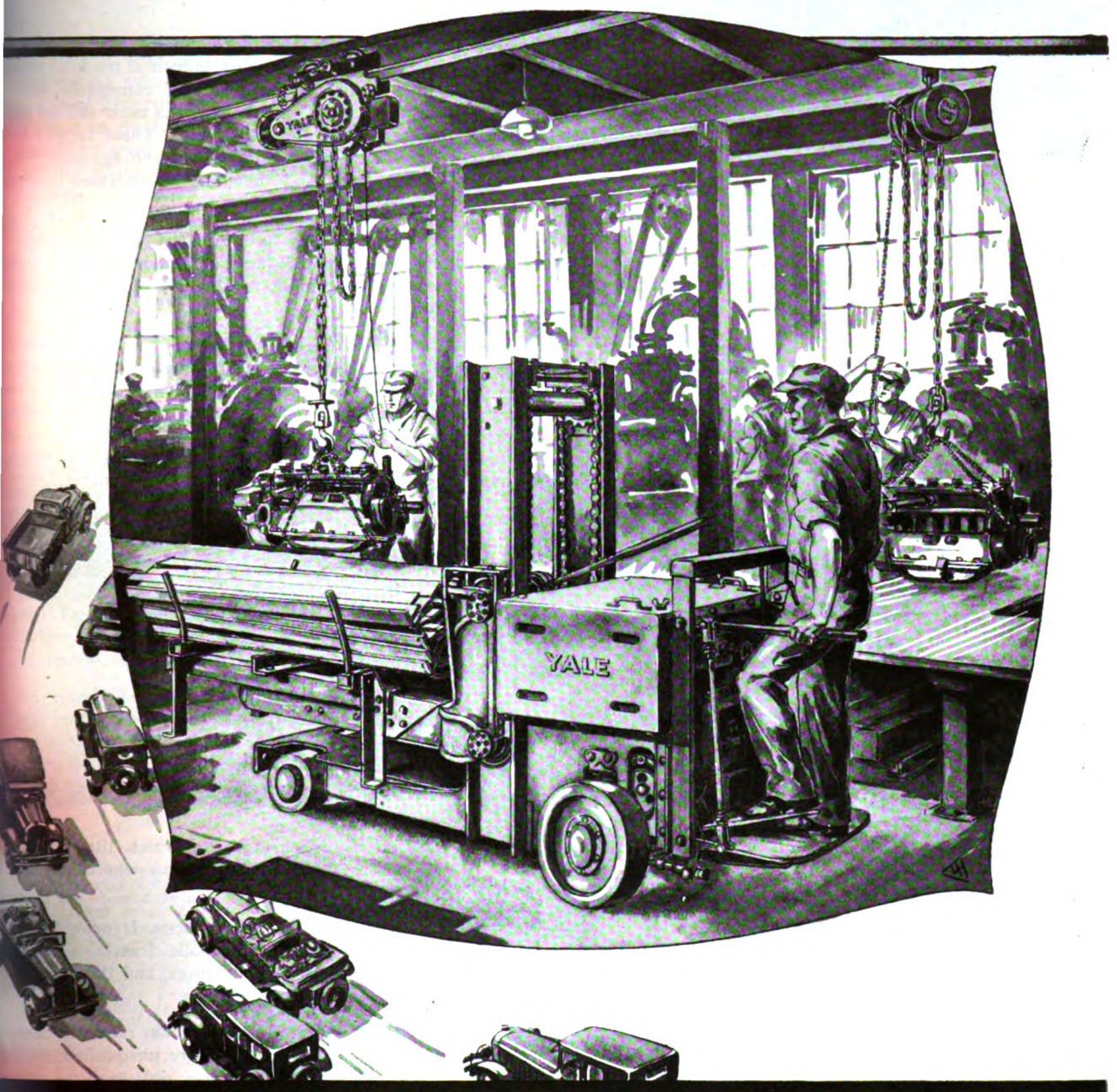
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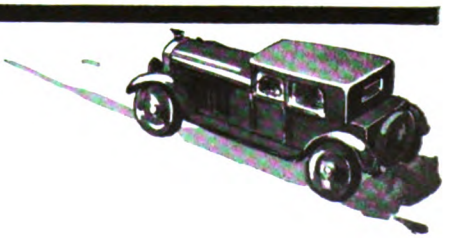
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TRADE YALE MARK

Material Handling Equipment



Over Fifty Years of Service to Industry

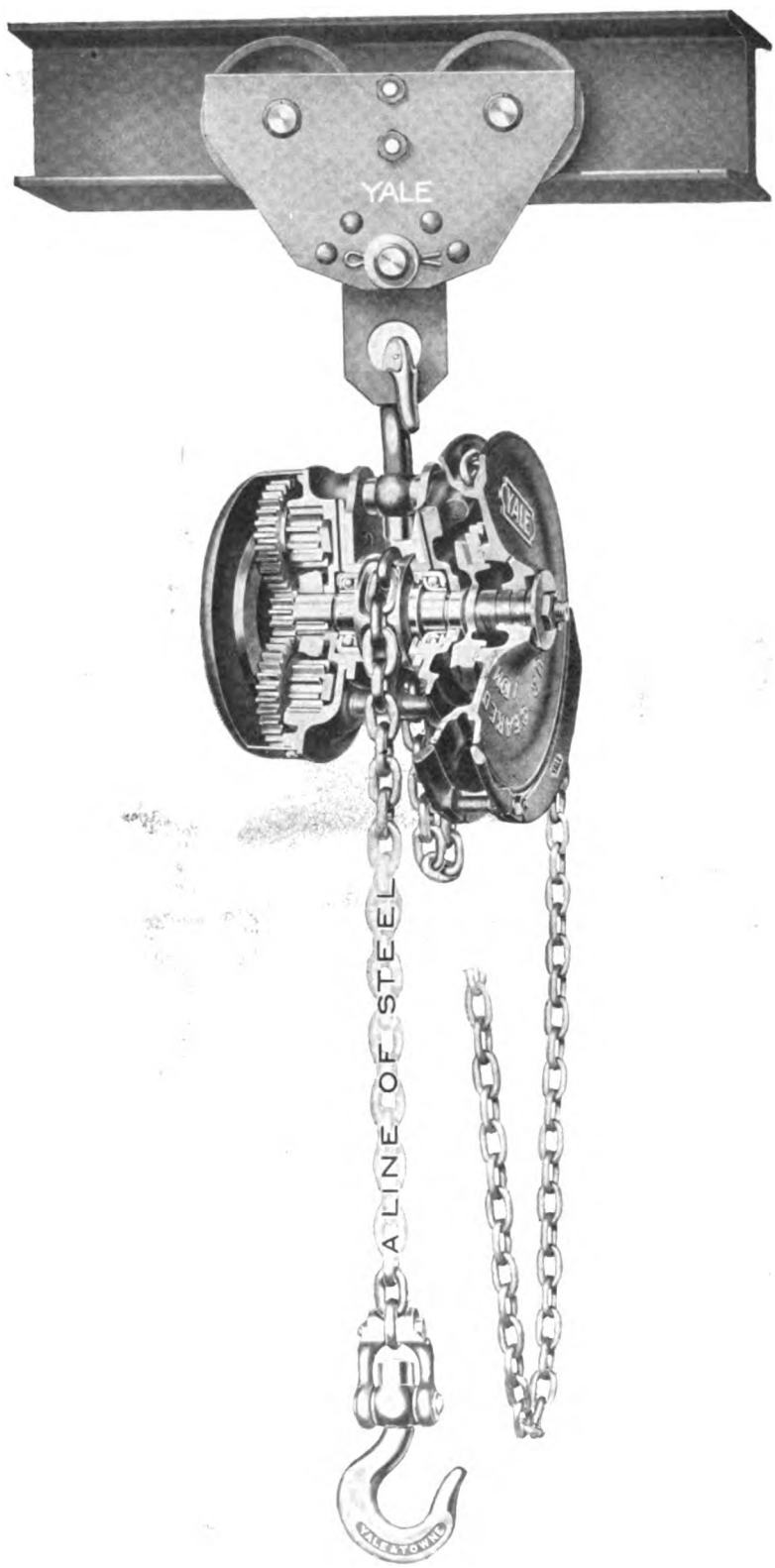


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Every Yale Handling Unit is

YALE Ball Bearing Chain Block and Roller Bearing Trolley



Every YALE Handling Unit—chain block, electric hoist, trolley, crane ends, industrial truck or tractor—has behind it the policy of constantly striving for the highest quality and the most skillful engineering principles attainable. These factors have been striven for from the beginning, over half a century ago, and they are incorporated in every YALE Unit today.

These principles have resulted in the building of equipment which has aided industry in bringing materials handling to the high plane it occupies today.

These YALE Standards are—accuracy in design, ample factors of safety, precision in manufacture, frequent inspections, exhaustive tests at every step in the manufacture from raw materials to finished products. Every chain block, electric hoist and truck is given an overload test greater than its rated capacity, which assures maximum carrying ability.

Chain Block Facts

Roller and ball bearings have reduced friction losses to the minimum, and superior reduction gearing helps to maintain the highest efficiency.

YALE Ball Bearing Spur-Geared Chain Blocks range in capacity from ¼ to 40 tons. They possess the highest mechanical efficiency available in any chain block hoisting equipment. They wear longer, lift more easily and quickly and are safer than any other block made.

YALE Ball Bearings, on which the steel load sheave rotates, reduce friction where friction is greatest.

A thorough lubrication system is provided. Oil ducts pass through the solid frames, conducting oil direct to the ball bearings, and then on to the driving pinion shaft bearings.

Yale Screw-Geared Chain Blocks range in capacity from ½ to 5 tons. They are unequalled for jobs where portability, lightness and strength are essential but where speed is a secondary factor.

Yale Differential Chain Blocks range in capacity from ¼ to 2 tons. Like Yale Chain Blocks of every type, the Yale Differential Block is all Yale-made. It is constructed, part by part, in the Yale plant and the line equipped throughout with the same electric-welded steel chain and die-formed hooks furnished with Yale Spur-Geared and Screw-Geared Blocks.

YALE MARKED

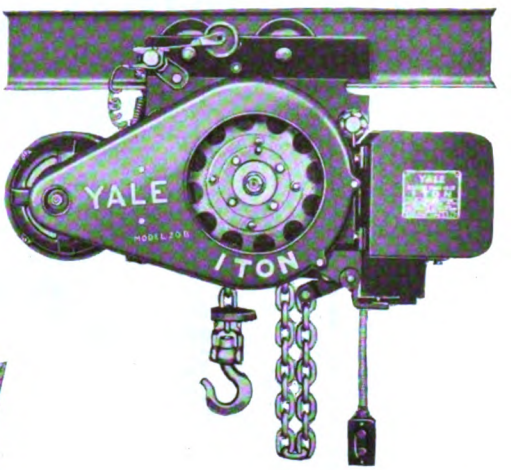
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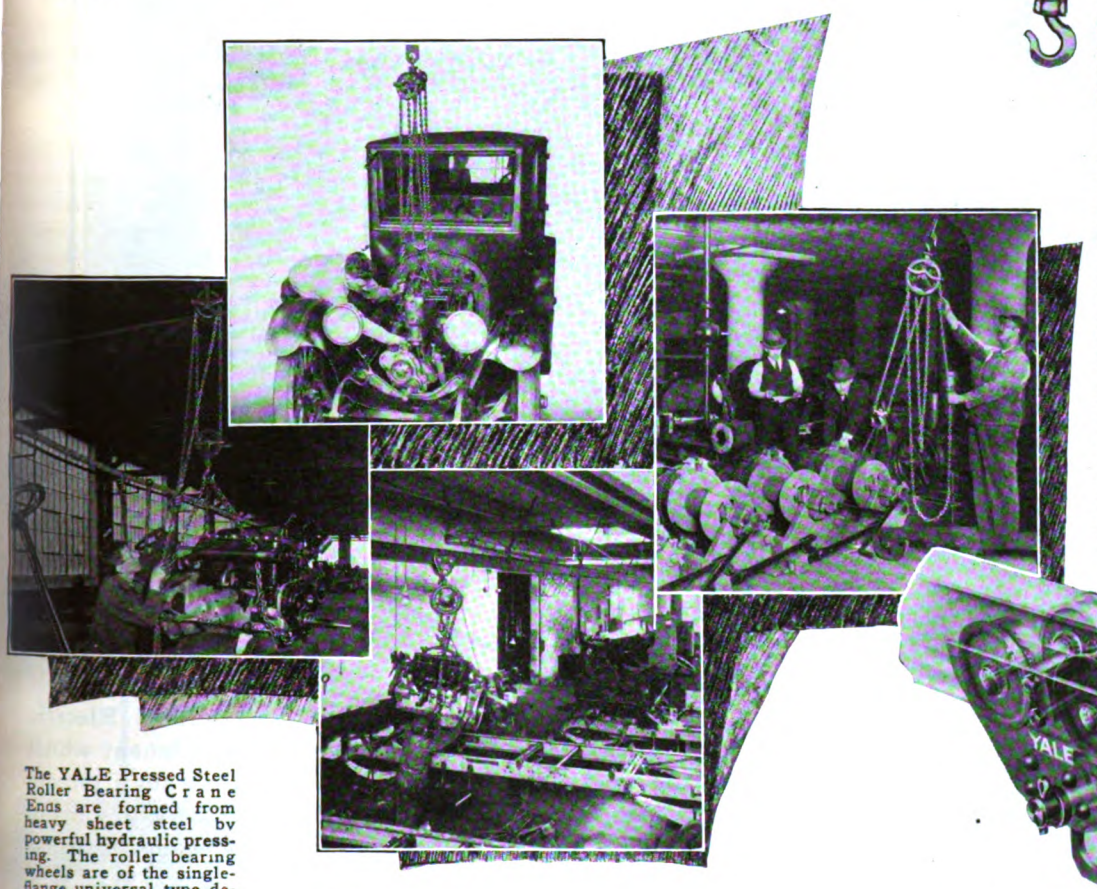
backed by Yale Standards

Other YALE Handling Units

In every YALE Unit, you will find the same high factors of safety, the same principles of skillful engineering incorporated and the same ability to give the utmost in performance. All tending to reduce the tremendous overhead with which industry is burdened in moving parts and products during the process of manufacture.

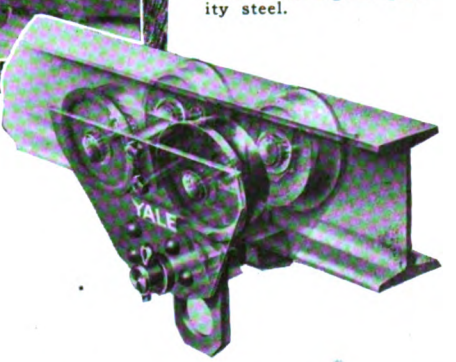


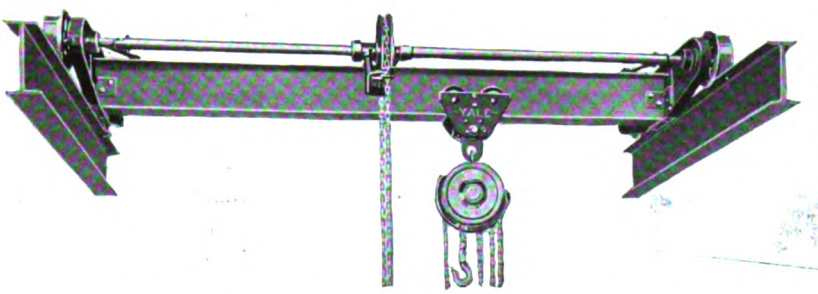
YALE Model 20B Ball-Bearing Electric Chain Hoists range from ¼ to 2-ton capacity. The latest design embodies such features as a ball bearing load sheave, closer headroom, longer lift, higher speed, automatic top and bottom limit stops, and greater overall strength. These hoists have very unusual factors of safety in the strength of the load supporting members and are designed to withstand shock loads so common to this class of equipment. All suspension members of the YALE Electric Chain Hoist are made of the highest quality steel.



The YALE Pressed Steel Roller Bearing Crane Ends are formed from heavy sheet steel by powerful hydraulic pressing. The roller bearing wheels are of the single-flange universal type designed for use on I-Beam, channel or T-rail runway. Capacity up to 1 ton. Adaptable for hand block or electric hoist. Spans up to 21 feet, inclusive. Travel chain pull in pounds, 10 to 30.

The YALE Cast Steel Roller Bearing Crane Ends have 5-ton capacity and spans up to 37 feet.





YALE Steel-Plate Roller-Bearing Trolleys range in capacity from ¼ to 20 tons. Their outstanding characteristics are strength, flexibility, roller bearings, hardened and ground axles, chilled tread wheels and heavy cold-rolled steel equalizing pins.

The Yale & Towne Manufacturing Co. *Stamford, Conn., U. S. A.*

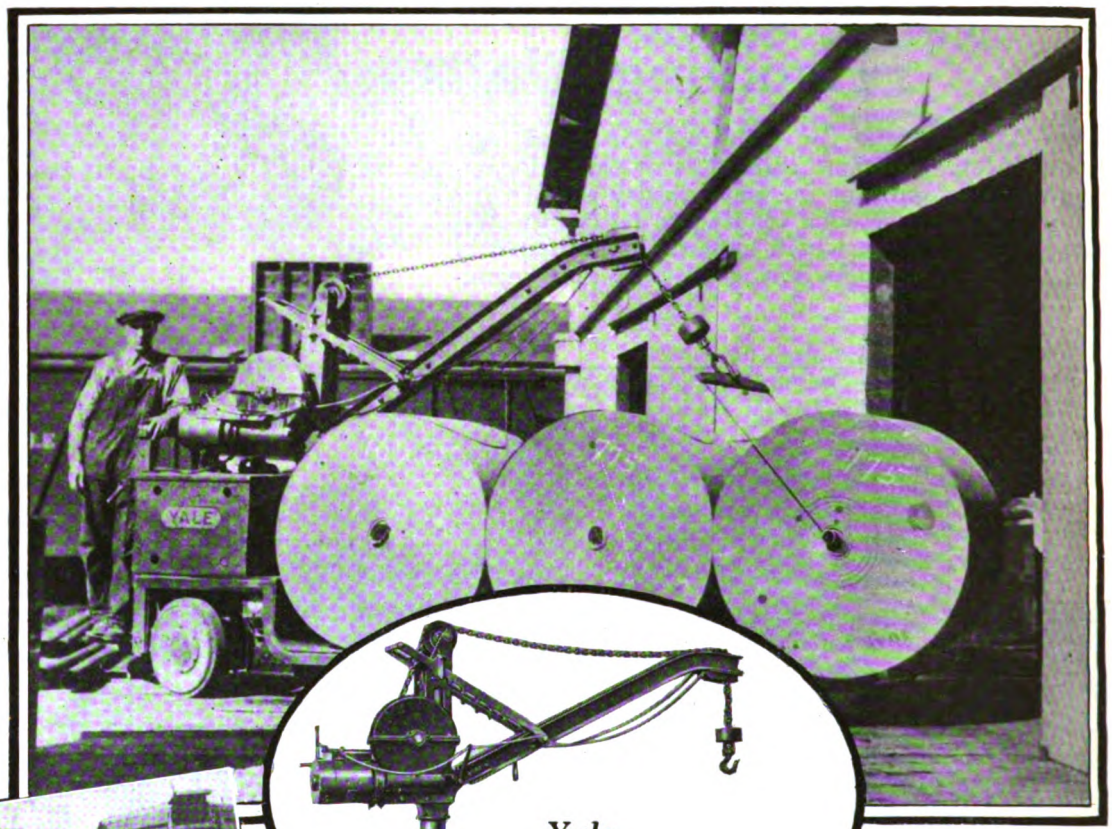
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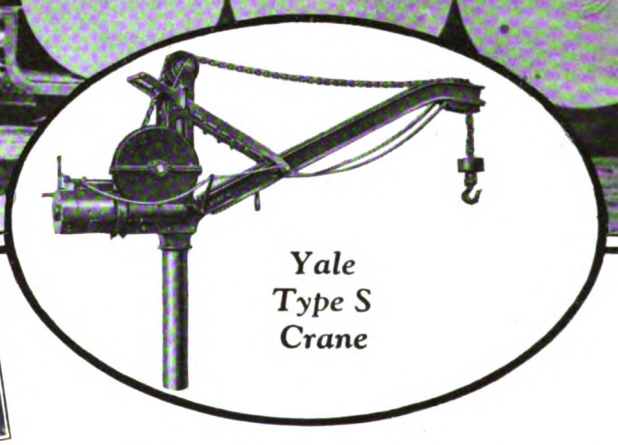
Makers of Yale Products: Locks, Door Closers, and Material-Handling Equipment

IS YALE MADE

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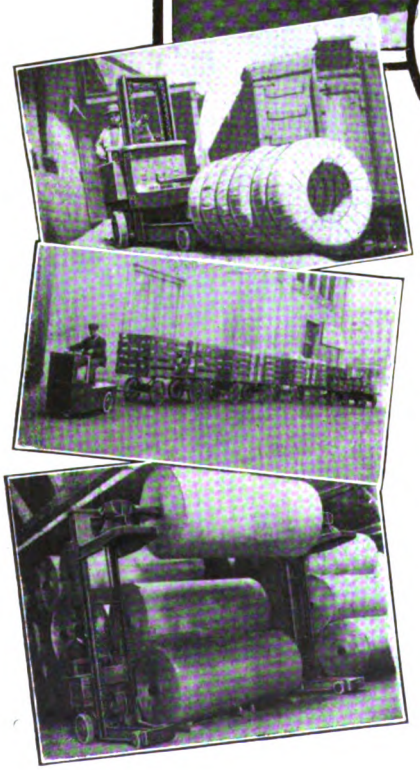
— *and for Hauling and Loading* *a* Yale Electric Truck and Crane





Yale Type S Crane

YALE MARKED IS YALE MADE



Many unusual jobs can be performed with YALE Electric Industrial Trucks. In addition to the crane attachment which performs the work of several men and which, through remote control, enables one man to handle the job, there are many other attachments which result in a complete efficient handling system.

A YALE Truck handles miscellaneous cargo in stevedoring service. A YALE Tractor does express service. A YALE Tiering Truck with Boom Attachment handles coils or rolls of wire. Two in unison stack 8000 pound rolls of paper and still another spots freight cars in and out of a machine shop. YALE Trucking Systems perform economically in practically every industry. Write our engineers. Their experience in the various industries is at your service.

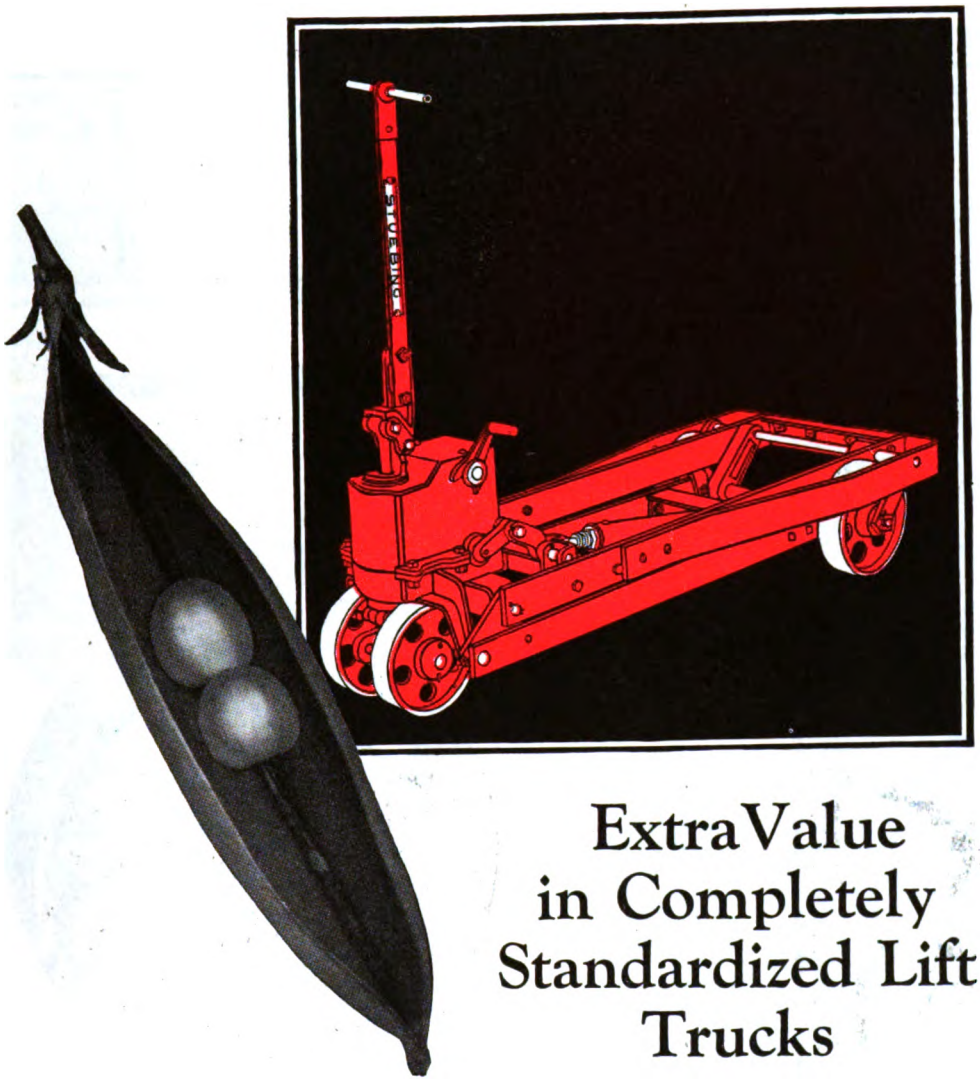
The Yale & Towne Manufacturing Co.

Stamford, Connecticut, U. S. A.

YALE **Hoisting and Conveying Systems**

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Extra Value in Completely Standardized Lift Trucks

Two peas in a pod are no nearer alike than two Stuebing-Cowan trucks of the same model, size and capacity, regardless of how many years might intervene between their production dates.

Parts used to meet today's orders will fit truck No. 146 owned by Goodyear, bought many years ago. This means a vast saving to you in idle equipment—in satisfactory and continuous operation—in repair cost.

Getting Stuebing-Cowan equipment is getting troubleless trucking service at lowest possible cost.

Your telephone will connect you with a direct factory branch.



Stuebing Steel Bound — Patent Bound — Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble.

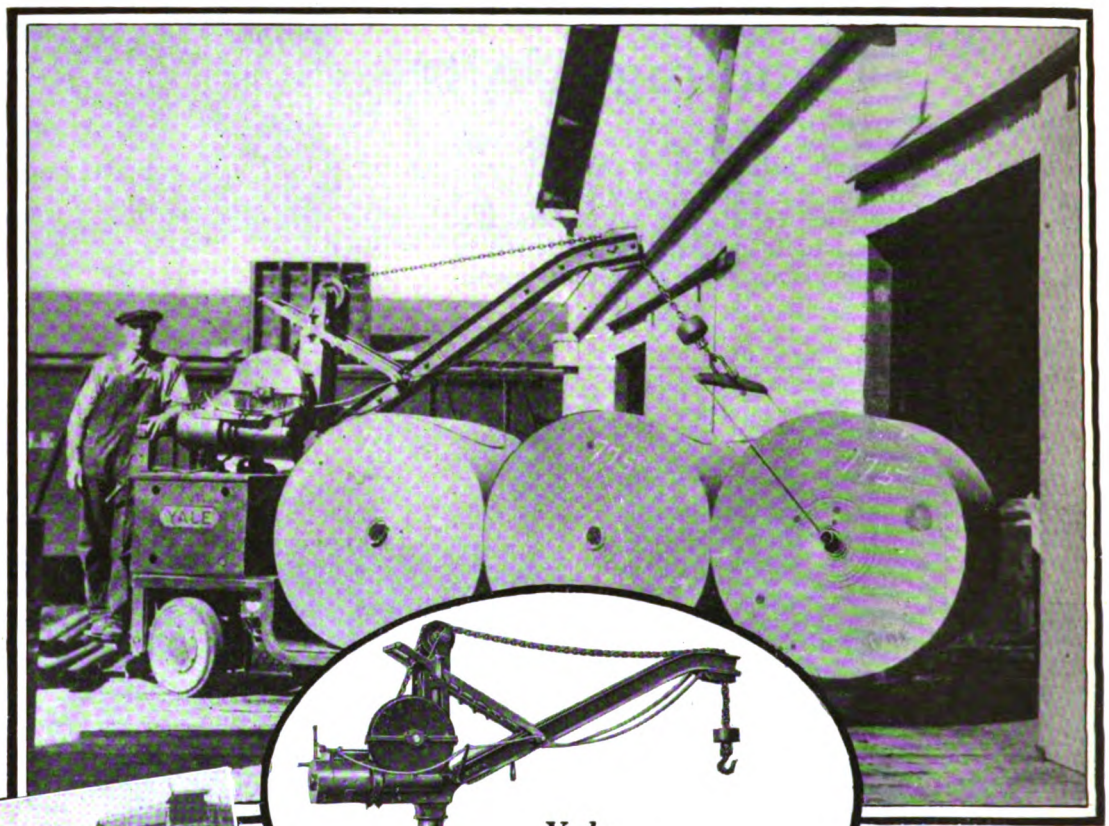
The Stuebing-Cowan Co.

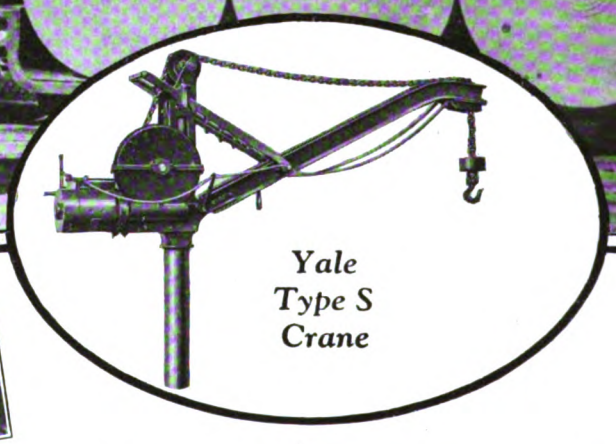
Cincinnati, Ohio • • • Holyoke, Mass.

StueBing COWAN

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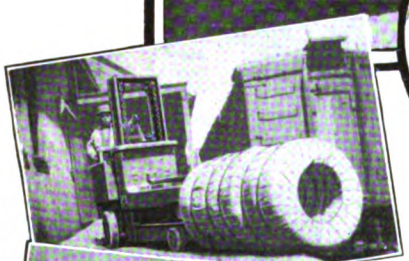
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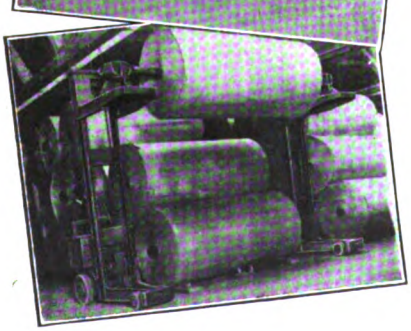


Yale Type S Crane

YALE MARKED IS YALE MADE







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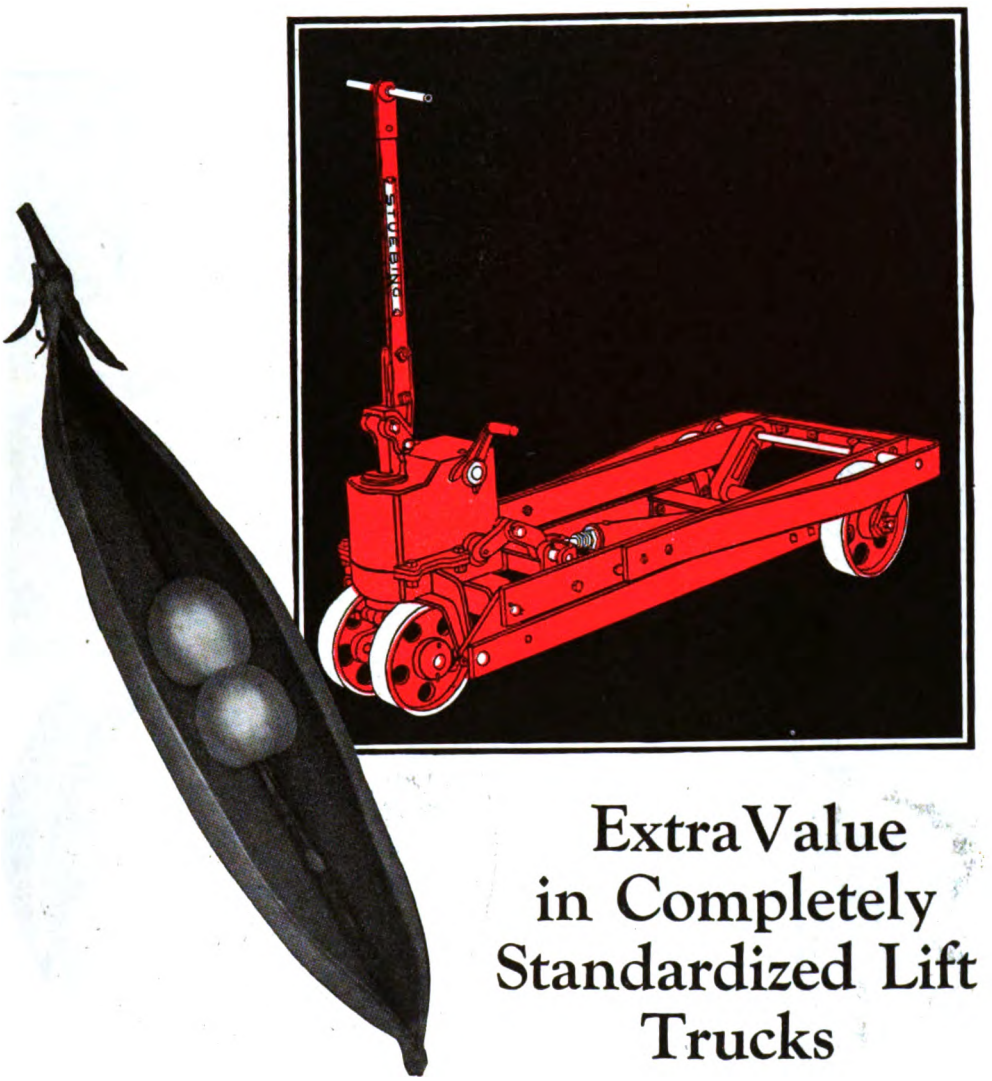
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Stamford, Connecticut, U. S. A.

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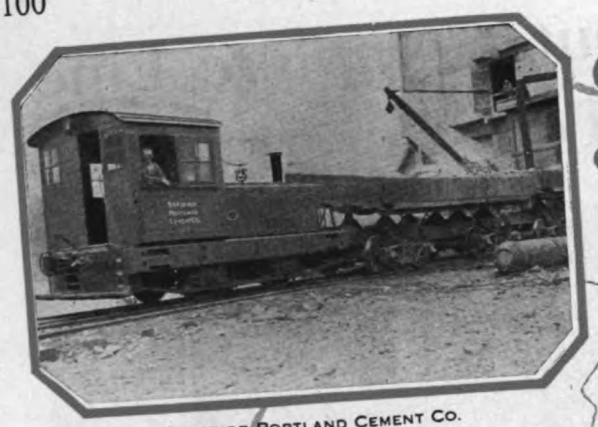
Stuebing Steel Bound — Patent Bound — Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble.

The Stuebing-Cowan Co.

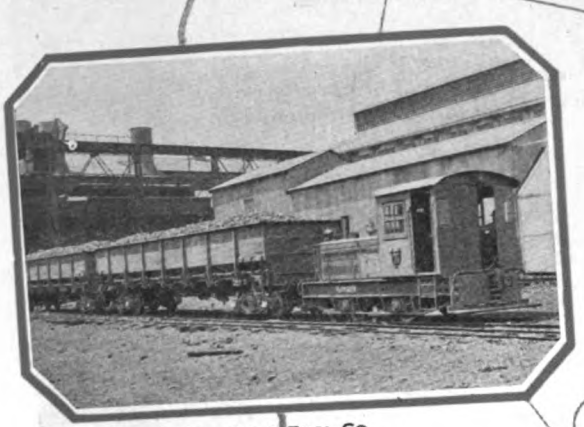
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StueBing COWAN

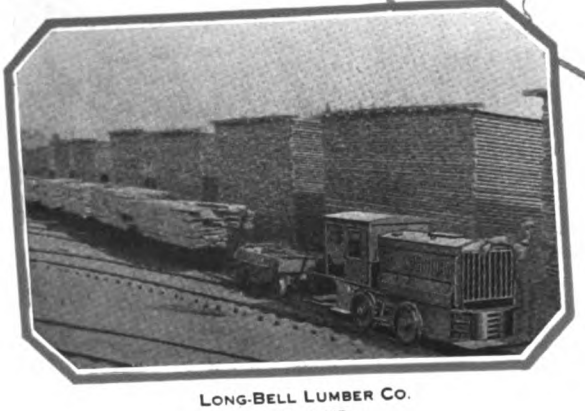
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SUPERIOR PORTLAND CEMENT CO.
CONCRETE WASH



UNION TOOL CO
TORRENCE, CALIF.



LONG-BELL LUMBER CO.
WEED, CALIF.

From Coast to Coast

Plymouths Predominate in

A Partial List of Purchasers

Alpha Portland Cement Co. (4)	Easton, Pa.
American Car & Foundry Co. (3)	New York
American Sheet & Tin Plate Co. (3)	Pittsburgh
American Steel & Wire Co.	Worcester, Mass.
American Writing Paper Co.	Holyoke, Mass.
Armour Fertilizer Works	Chicago
Atlantic Refining Co. (2)	Philadelphia
Atlas Portland Cement Co. (3)	New York
Bakelite Corporation	Bloomfield, N. J.
Beaver Portland Cement Co.	Portland, Ore.
Bethlehem Steel Corp. (4)	Bethlehem, Pa.
British Columbia Cement Co.	Vancouver, B. C.
Buick Motor Co. (5)	Flint, Mich.
Calaveras Cement Co. (2)	Valley Spring, Cal.
Camden Forge Co.	Camden, N. J.
Camp Mfg. Co. (6)	Franklin, Va.
Canada Cement Co. (6)	Winnipeg, Canada
Cayuga Operating Co. (3)	Portland Point, N. Y.
Certainteed Products Corp. (2)	St. Louis
Jas. B. Clow & Son (5)	Chicago
Commercial Solvents Corp.	Peoria, Ill.
C. & G. Cooper Co.	Mt. Vernon, Ohio
Dominion Iron & Steel Co. (2)	Sidney, N. S. Canada
E. I. Du Pont De Nemours Co. (2)	Wilmington, Del.
Duquesne Slag Products Co.	Pittsburgh
Durex Chemical Corp.	New York
Electro Metallurgical Co. (2)	New York
Empire Mills Co.	Columbus, Ga.
Ferracute Machine Co.	Bridgeton, N. J.
The Ferro Machine & Foundry Co.	Cleveland
Ford Motor Co. (2)	Glassmere, Pa.
Gary Tube Co.	Gary, Ind.
Grand Rapids Gas Light Co.	Grand Rapids, Mich.
Grasselli Chemical Co. (24)	Cleveland
Grasselli Powder Co. (4)	Cleveland
Great Lakes Portland Cement Co. (2)	Buffalo
Hercules Powder Co. (6)	Wilmington, Del.
Holmes Foundry Co., Ltd. (2)	Port Huron, Mich.
Hyper-Humus Co. (4)	Newton, N. J.
Illinois Steel Co.	Chicago
Illinois Zinc Co. (4)	Peru, Ill.
Irvington Smelting & Refining Works	Irvington, N. J.
Jessop Steel Co.	Washington, Pa.
Jones & Laughlin Steel Corp.	Pittsburgh
Jordan Bros. Lumber Co. (3)	Norfolk, Va.
Keith Car & Mfg. Co.	Worcester, Mass.
Kneeland-Bigelow Co. (2)	Bay City, Mich.
Knickerbocker Portland Cement Co. (2)	New York
Lawrence Portland Cement Co. (6)	Northampton, Pa.
Lehigh Portland Cement Co. (9)	Allentown, Pa.
F. J. Lewis Mfg. Co.	Chicago
Louisville Cement Co. (2)	Louisville, Ky.
McKinney Steel Co. (6)	Cleveland
Manito Chemical Co.	Peoria, Ill.
Martin-Dennis Co. (2)	Newark, N. J.

Plymouth Locomotives are made in 3 to 25 Ton Sizes and to any track gauge.

PLYMOUTH LOCOMOTIVE WORKS

PLYM

Gasoline

We will exhibit at the Cleveland Industrial Exposition

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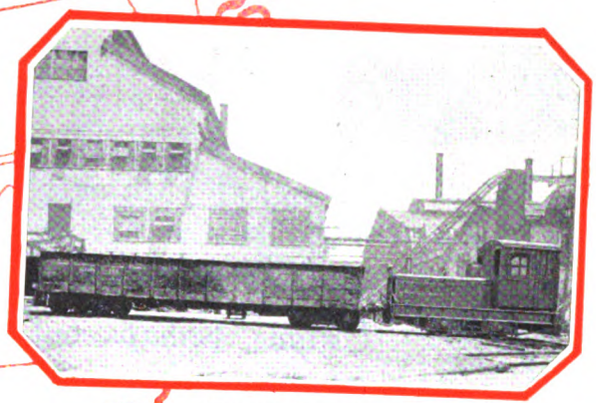
General Industrial Haulage

Note the Repeat Orders

Merchants Despatch Transportation Co., E. Rochester, N. Y.
Merrimac Chemical Co. ..... Boston
Mississippi Lime & Material Co. (3) ..... Alton, Ill.
Monolith Portland Cement Co. (2) ..... Los Angeles
Morton Salt Co. (3) ..... Chicago
National Carbide Corp. ..... Ivanhoe, Va.
National Mortar & Supply Co. (7) ..... Pittsburgh
Natural Products Refining Co. ..... Jersey City, N. J.
Nazareth Cement Co. (3) ..... Nazareth, Pa.
New England Wood Preserving Co. ..... Pittsburgh
New Jersey Zinc Co. ..... New York
North American Car Corp. ..... Blue Island, Ill.
Northwestern Refrigerator Line Co. ..... Chicago
Ohio Hydrate & Supply Co. (6) ..... Woodville, Ohio
The Ohio Seamless Tube Co. ..... Shelby, Ohio
Old Mission Portland Cement Co. ..... San Francisco
Oliver Salt Co. ..... Mt. Eden, Calif.
Oneida Community (2) ..... Oneida, N. Y.
Pacific Portland Cement Co. (2) ..... San Francisco
Peerless Portland Cement Co. ..... Union City, Mich.
Pennsylvania Tank Car Co. ..... Sharon, Pa.
Penobscot Chemical Fibre Co. (3) ..... Boston
Peterman Mfg. Co. ..... Tacoma, Wash.
Phoenix Portland Cement Co. (3) ..... Philadelphia
Pullman Company ..... Michigan City, Ind.
Republic Iron & Steel Co. ..... Youngstown, Ohio
John A. Roeblings Sons Co. (4) ..... Trenton, N. J.
Seneca Iron & Steel Co. ..... Buffalo
The Sloss, Sheffield Steel & Iron Co. ..... Birmingham, Ala.
Solvay Process Co. (4) ..... Syracuse, N. Y.
St. Mary's Cement Co. (4) ..... St. Mary's, Ont.
A. E. Staley Mfg. Co. ..... Decatur, Ill.
Standard Gypsum Co. (3) ..... Ludwig, Nev.
Standard Slag Co. ..... Youngstown, Ohio
Stevens & Thompson Paper Co. ..... Greenwich, N. Y.
Strable Lumber & Salt Co. ..... Saginaw, Mich.
Tennessee Cement & Lime Co. (2) ..... Nashville, Tenn.
Tennessee Copper & Chem. Corp. (2) ..... New York
Three Forks Portland Cement Co. (3) ..... Denver, Colo.
Timken Roller Bearing Co. (3) ..... Canton, Ohio
Tredegar Iron Works (2) ..... Richmond, Va.
Union Tool Co. (2) ..... Torrance, Calif.
Universal Gypsum Co. (3) ..... Akron, N. Y.
Universal Portland Cement Co. ..... Chicago
United States Metals Refining Co. (3) ..... Carteret, N. J.
U. S. Gypsum Co. (3) ..... Chicago
U. S. Phosphoric Products Corp. ..... East Tampa, Fla.
Utah Idaho Cement Co. ..... Ogden, Utah
Utah Salduro Co. (4) ..... Salduro, Utah
Western Salt Co. (2) ..... San Diego, Calif.
H. C. White Co. ..... North Bennington, Vt.
Whitall Tatum Co. (2) ..... Millville, Pa.
Whitehall Cement Mfg. Co. (5) ..... Cementon, Pa.
White Star Plaster Co. ..... Los Angeles
Wilkes, Martin, Wilkes Co. ..... New York
Youngstown Sheet & Tube Co. ..... Youngstown, Ohio



GREAT NORTHERN PAPER CO
BANGOR, MAINE



WHITALL TATUM CO.
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Write for catalog and performance Bulletins.

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OUTH Locomotives

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Most any floor's a boulevard for Bassicks



—Quick, easy starting. Smooth—easy rolling—quiet and safe rolling. Easy turning.

—over the bumps and ruts. Off the smooth path onto the rough—without damage to floors—or loads—or casters.

Unique, perhaps, but characteristic of Bassicks.

How easily it rolls on Bassicks

And Why Not?

BASSICKS are made by an engineering organization—made to meet average and under average conditions, in plant and warehouse.

Each number in the Bassick line is "geared" to the job it is intended to do—and it does it.

You can depend upon sturdy Bassicks—always—for efficiency—as well as economy.

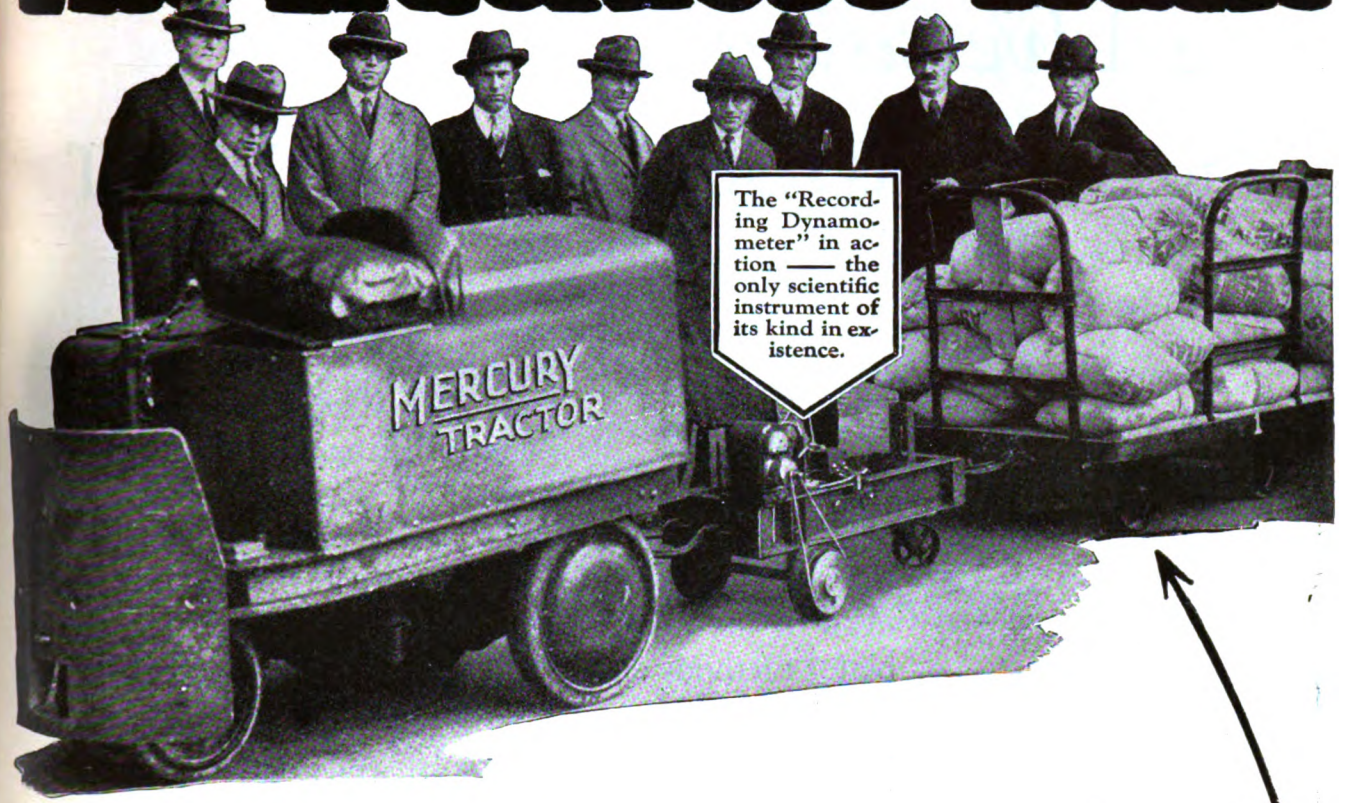
It will pay you to know Bassicks—better. *Send today for Catalog F-104.*

Bassick Casters
Reg. U. S. Pat. Off.
The BASSICK COMPANY
(A Division of Stewart Warner)
BRIDGEPORT, CONN.

For thirty-one years the leading makers of Better Casters for home, office, hotel, hospital, warehouse and factory.

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The Trackless Train



The "Recording Dynamometer" in action —— the only scientific instrument of its kind in existence.

To Specialize Is To Achieve!

Fourteen years ago "Mercury" designed and introduced the original electric tractor and gave to industry the system of material movement ~ (The Trackless Train) ~ founded thereon.

Thru-out the succeeding years "Mercury" has remained pledged to the one ideal of building the best of tractors and trailers and in developing new and more efficient application of the equipment.

Mercury engineering talent has consistently conducted original and pioneering research to guide them in design and to collect reliable data for the guidance of Mercury sales engineers and for the benefit of Mercury customers.

Pictured above is the personnel and a portion of the equipment used in a three weeks test (and at the expenditure of thousands of dollars) to scientifically determine and tabulate—(1) *effect of wheels of different diameter*—(2) *draw-bar pull factors*—(3) *desirable operating speeds*—(4) *comparative characteristic of steel, wood and rubber wheels*—(5) *comparative merits of non-friction bearings*—(6) *trailing qualities of trailer types, etc., etc.*

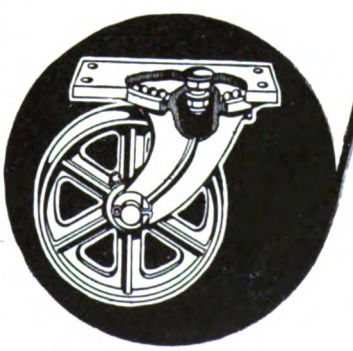
Mercury design and Mercury engineering counsel is based on exclusive knowledge secured from original research in the field of tractors and trailers and their application. This is one of the reasons why Mercury equipment and Mercury service is regarded as the standard of merit wherever tractors and trailers are bought and used.

Ask for Descriptive Bulletins.

"Mercury Castors"

—designed expressly for trailer service. Can be ordered separately for application on your present equipment. Sizes from 6" to 12". Steel or rubber tired wheels.

Write for Prices



Mercury Manufacturing Company

112 South Halsted Street Chicago, U. S. A.

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to The INDUSTRIAL MARKET

INDUSTRIAL MANAGEMENT, the pioneer publication in the field of management and production practice, was first published 36 years ago. From the very first issue and on through to the present, its articles have guided the men at the head of the larger plants in every industry toward better methods and newer ideas in manufacturing.

Through INDUSTRIAL MANAGEMENT, the advertiser can reach a substantial number of executive readers in the larger plants of all industries.

The advertiser who employs INDUSTRIAL MANAGEMENT in combination with INDUSTRY ILLUSTRATED covers the Industrial Market virtually without duplication. A special discount is given to all who employ both publications.

May we give you the facts?

The INDUSTRIAL GROUP
381 Fourth Avenue
New York City

t advertised in this issue write Industry Illustrated

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If confirmation is necessary—

AFTER all, there is no proof like that of actual use. These extracts from two letters by one owner of an "American" Pressed Steel Hand Truck tell a story duplicated by other users.

In July of last year he wrote: "We have put it at a point in our warehouse where other trucks have been unable to stand the strain. We are watching it carefully."

Four months later: "It has proven more than satisfactory. The writer took particular notice of it the other day and examined it to see how many bolts and nuts were missing, as is usually the case after a truck has been in service a few months. We are happy to say it is all intact and is in the same condition as it was when received, with the exception of its complexion, which is disturbed slightly here and there."

Another user wrote to his mill supply house: "Our men report these 'American' Trucks are, without question, the best trucks they have used. We can assure you that when additional trucks are needed we will specify the 'American' All-Steel Truck."

Still another distributor received this letter: "Already have two 'American' Trucks in service. Think they are the best we have seen. Whenever we need any more, you get the order."

And from a fourth, this comment: "Truck is well built, prefer it to the ordinary type, also very reasonable in price."

But the best way to check these statements for yourself is to order a sample "American" and put it to work where the service is hardest.

Ten styles illustrated in catalog. Write for it.

THE AMERICAN PULLEY COMPANY

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Shapes and Pressed Steel Hand Trucks

4200 Wissahickon Avenue Philadelphia, Pa.

The "American" franchise is of real value to the mill supply house because of The American Pulley Company's consistent dealer policy. Find out about "American" products and policy.

AMERICAN
PRESSED STEEL
TRUCKS
PATENTS PENDING

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ANCHOR CONVEYORS

Speed Production in America's Prominent Automotive Plants

THESE illustrations tell a remarkable story of progressive assembly; of production considerably speeded up, of handling by truckers and laborers virtually eliminated and floor space utilized to the fullest extent. All the result of this ANCHOR Continuous Overhead Conveyor.

This installation is in the plant of the most talked about automotive company in America—a plant turning out thousands of cars weekly.

The savings effected should interest every industrial executive today. Send coupon for complete details. No obligation.

Anchor Steel & Engineering Co

2563 Bellevue Ave. Detroit, Mich.

MAIL THIS COUPON

ANCHOR STEEL & ENGINEERING CO.
2563 Bellevue Ave., Detroit, Mich.

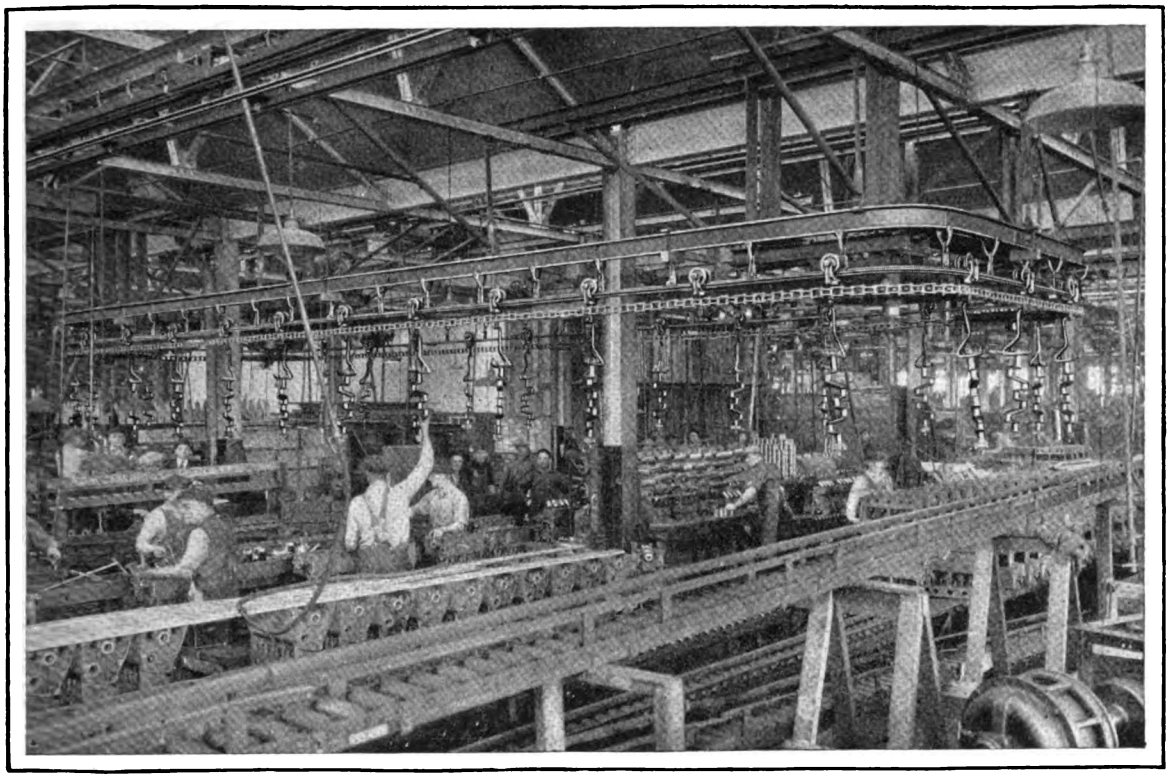
Without any obligation, send me full details of the installation shown in The INDUSTRIAL GROUP.

Name ..... ***Company*** .....

Position ..... ***Products*** .....

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The Louden Overhead Track and Trolley System pictured above is saving time, energy, and money in one of the large Automotive plants. Here Louden Monorail is used in conjunction with a motor driven chain carrying 200 crank shafts

at this very moment— put your mind on this "*single track*"!

Is the ceiling in your plant a broad expanse of wasted space? Is your material still being moved laboriously and at great expense by hand? Then you are ignoring one of the greatest sources of economy and profits in your plant. *You need to investigate the wonders of economy accomplished by the Louden Industrial Monorail System of Overhead Lifting and Carrying.*

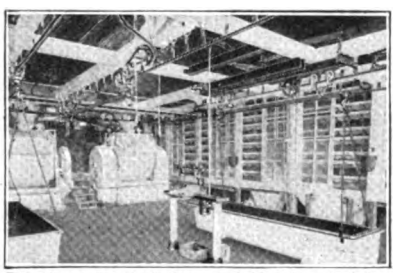
Your ceiling can be made the right of way for a Louden Monorail which will speed up the handling of your product in every stage of its manufacture. It will reduce handling charges, relieve congestion on the floor, prevent accidents, and eliminate the exhausting labor of lifting and hauling. That one rail on the ceiling is worth twenty men on the floor! It binds departments together in a unit and coordinates their work. By increasing productive capacity the expense of new building is postponed or saved.

Get this Book on Material Handling



Just off the press. It tells a remarkable story about the conveying of materials in process of manufacture, handling finished products, etc. 56 pages of dimensioned drawings and 72 pages illustrating application of Louden Monorail to many types of work, including yours, complete information on track, trolleys, switches, dipping machines, cranes, monorail scales, track hoists, etc. Shows how to cut production costs. Write for a copy of this valuable book. No cost or obligation.

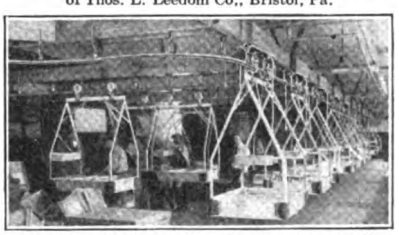
The Louden Monorail System is adaptable to any plant, large or small, to the handling of practically any material or product up to 2000 pounds. Its trouble-proof perfection is the result of years of patient development and the test of actual service in thousands of plants. A variety of uses and a wide flexibility of application make it one of the most definite reducers of overhead costs that can be found for any industry. It will prove successful in your plant. *It will make your ceiling a right of way to greater dividends.*



This Monorail scale for beam weighing is part of the Louden System that holds down costs for the Harris-Boyer Baking Co., Johnstown, Pa. Loaded troughs weigh about 1500 pounds.



Louden Monorail is making big savings in the textile field. Chain drive trolley conveyor system in plant of Thos. L. Leedom Co., Bristol, Pa.



"All orders filled the day received" is a good policy made possible in the plant of the American Products Co., by the installation of a Louden Monorail and the right type of carriers.



Louden Monorail used inside and outside to speed up the handling of concrete blocks for R. E. Hamilton Sons, Detroit, Mich.

The LOUDEN MACHINERY COMPANY
706 West Ave. (*Established 1867*) Fairfield, Iowa

Albany
Boston
New York
Philadelphia
Buffalo
Pittsburgh
Atlanta
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Cleveland
Toledo
Detroit
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LOUDEN

INDUSTRIAL MONORAIL SYSTEMS

for Overhead Lifting and Carrying

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Everedy Electric Hoist
Patented and patents pending. Light weight. Steel plate construction. Every moving part accessible. Patented adjustable up and down limit stop. Adjustable to any overhead conveyance. Capacity 500 lbs. to 12,000 lbs.

"Reading" Multiple Gear Chain Hoist
Self-lubricating. All gears cut from steel blanks and operate in a bath of oil contained in an oil-tight, dust-proof casing.

"Reading" Traveling Cranes
All steel construction. Highest grade of workmanship and material used. Cranes are built in several types and can be furnished for quick delivery.

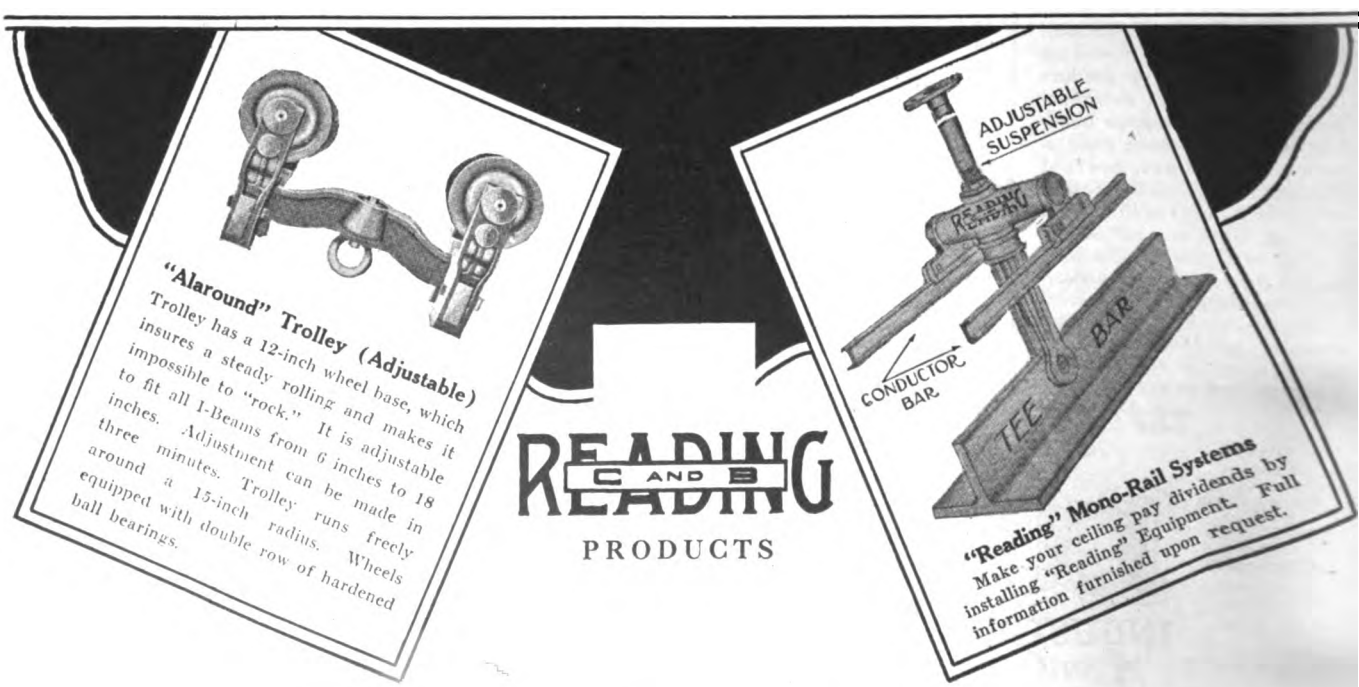
TWENTY YEARS OF FAITHFUL SERVICE

Every product leaving our factory carries an iron-bound guarantee against defective workmanship and material. Perhaps you have some kind of a material handling problem in your plant—and it may be possible that you don't realize it exists. Solving material handling problems is our business. In order to sell any of our equipment we must show the buyer, by actual figures, that while he is paying so much for machinery, he is going to get greatly reduced handling costs. Unless we can prove to you that "READING" Equipment will honestly pay for itself out of the savings, we have nothing to sell you.

At Your Service

READING CHAIN & BLOCK CORPORATION

READING, PENNA.



"Alaround" Trolley (Adjustable)
Trolley has a 12-inch wheel base, which insures a steady rolling and makes it impossible to "rock." It is adjustable to fit all I-Beams from 6 inches to 18 inches. Adjustment can be made in three minutes. Trolley runs freely around a 15-inch radius. Wheels equipped with double row of hardened ball bearings.

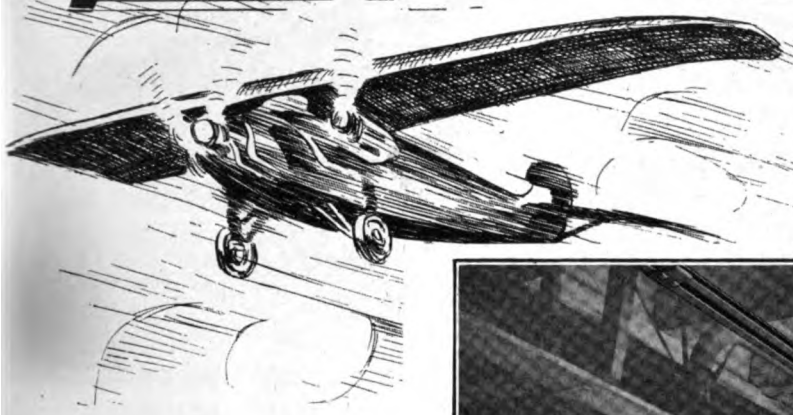
READING C AND B READING
PRODUCTS

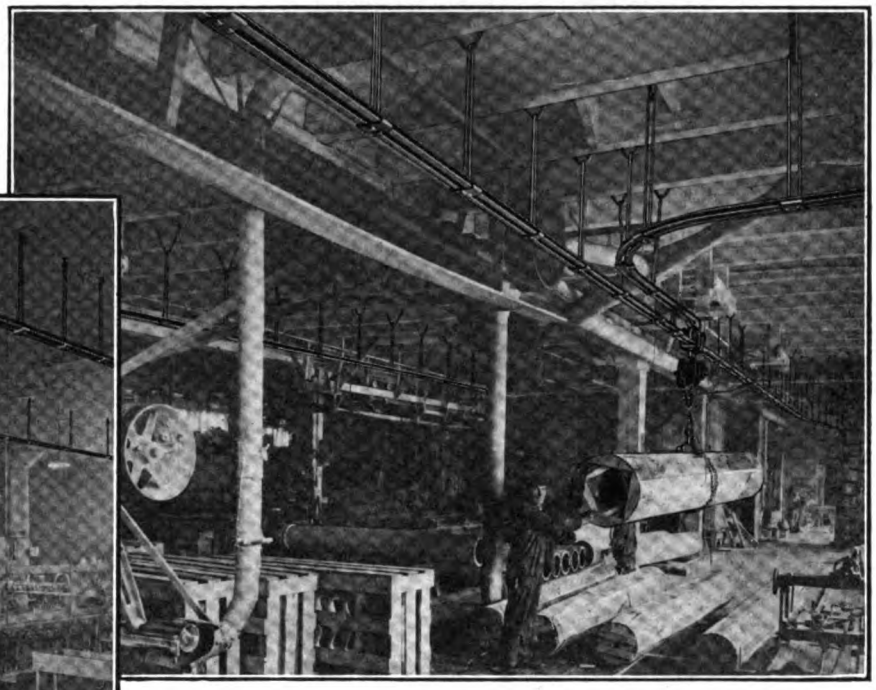
"Reading" Mono-Rail Systems
Make your ceiling pay dividends by installing "Reading" Equipment. Full information furnished upon request.

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Speed Plus Safety!

In your Overhead Handling with— DUO-RAIL







"The ATLAS of Handling"

offers you a valuable treatise on the subject of materials handling and shows why the railroad principle of overhead handling is the most economical means of conveying. We will gladly send you a copy.



The TWO-RAIL *Overhead Handling System*

Now, with the DUO-RAIL, products can be handled with dispatch and with absolute safety.

The TWO-RAILS instead of one as in the old method, eliminate all the jerky motions and jars which the single rail is subjected to.

Just as in railroad transportation, the rails are staggered. This results in steadier, more efficient handling of all materials—products, such as glass, wet enamelware, pottery cement forms, foundry flasks, molten metal and very awkward loads are now easily handled around the sharpest turns.

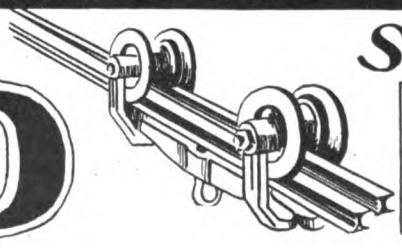
Before you make any additions of handling equipment, investigate the DUO-RAIL.

The ATLAS-CHICAGO COMPANY

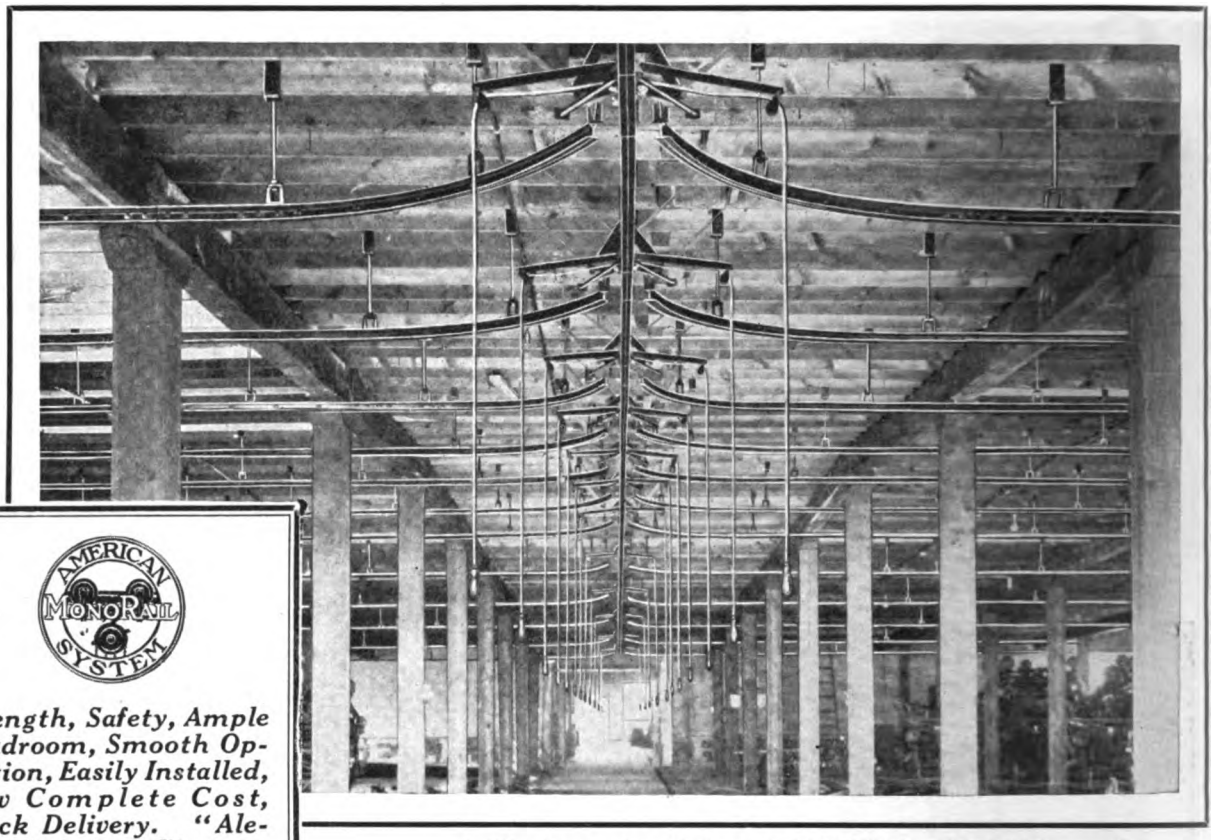
Division of Chicago Electric Company

742 West Van Buren Street, Chicago, Illinois

The Atlas DUO System RAIL



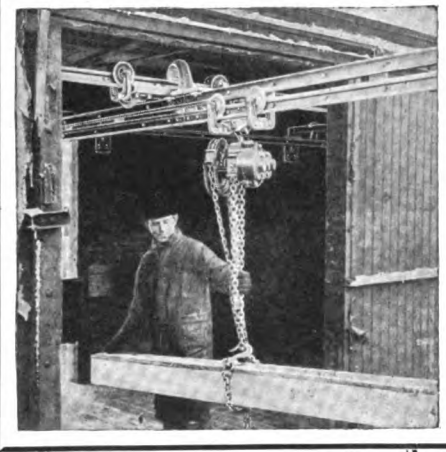
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A Warehouse Installation of AMERICAN MONORAIL at the Russell Grader Mfg. Co., Minneapolis, Minn.

AMERICAN MONORAIL SYSTEM

Strength, Safety, Ample Headroom, Smooth Operation, Easily Installed, Low Complete Cost, Quick Delivery. "Alemite Lubricated"



AMERICAN MONORAIL BOX CAR UNLOADER

Brings the remote ends of box cars, and every foot of car floor space within easy reach of your monorail system. Can be set up in any box car, large or small, in fifteen minutes, and dismantled and removed in five minutes. Handles all kinds of materials.

Over — Under — Through

An American MonoRail "Goes Anywhere"

AN AMERICAN MonoRail System cuts out the delays and lost motion in material-handling. Over crowded floors and machinery; through narrow aisle-ways impassable to other handling methods; American MonoRail will guide your raw materials and finished products to the required points—swiftly, efficiently, and at minimum operating and investment cost.

Will You "Take a Dare"—and Save Costs?

Right now, in your own plant, there are probably handling operations which could be done more economically by American MonoRail.

Will you—entirely without obligation—let our Engineer, who knows MonoRail applications, call and tell you WHERE, HOW and WHY you can make these savings?

HERE'S OUR GUARANTEE

We guarantee that every installation we recommend will perform satisfactorily in every detail the work for which it is designed.

WRITE US TODAY

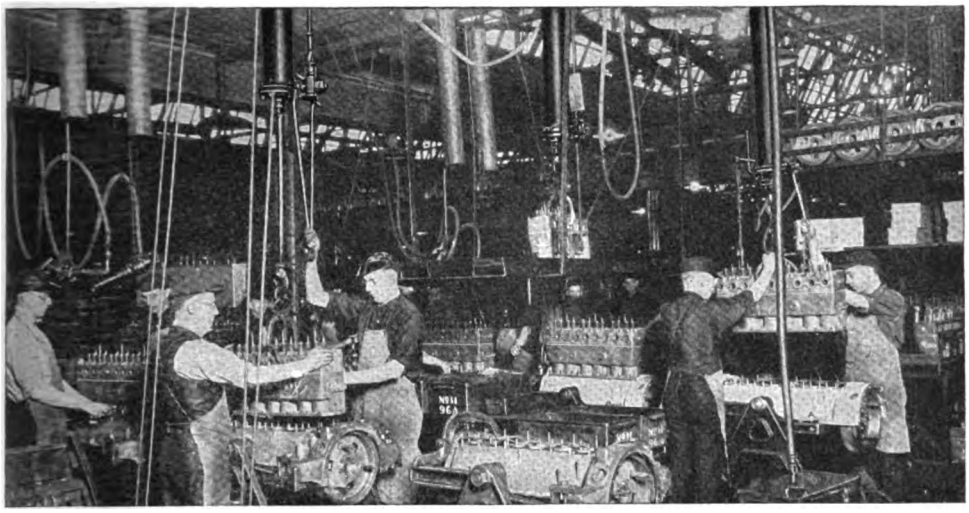
The American MonoRail Company

1963 West 67th St., Cleveland, O.

Products not advertised in this issue write Industry Illustrated

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CURTIS COMPRESSORS, HOISTS, CRANES, CAR WASH SYSTEMS, PORTABLE COMPRESSOR UNITS



Keep Production Moving with Curtis Air Hoists

Here you see Curtis Hoists helping to keep things speeded up in one of America's largest automobile factories. Everything moves smoothly and rapidly. They cannot afford a "traffic jam" which would throw the entire production line into confusion.

The Curtis Hoist is adapted to just such lifting problems because of its simplicity and accuracy. No gears to strip; no cables to part; no brakes to slip; just powerful compressed air, harnessed to lift safely, and controlled with hairbreadth accuracy.

It is economical to do your lifting with Curtis Air Hoists, too. The hoist costs little more than a chain block and your compressor will furnish air for so many other time-saving tools. New uses for compressed air are being developed daily in every industry. In just the small section pictured above, you see air hammers, air wrenches and air jets for use in speeding up the small jobs.

A study of your production system with this in mind, no doubt will show places where Curtis air lifts will cut several minutes from your operation. After you have made that study ask the Curtis Engineering Department to help you solve your problem.

Fill out attached coupon for complete catalogue on Curtis Hoists, Cranes, Trolleys and Air Compressors.

Just a Few Applications of the Curtis Air Hoist

Pulling ice cans in ice manufacturing plants; lifting automobile bodies, chasses and engines in automobile plants and garages; lifting axles, wheels, trucks or armatures in steam or electric railway shops, operating lifts on railroad unloading platforms; lifting large flasks, large castings and heavy cores; operating furnace doors, in foundries; special use in connection with heavy presses; operating freight elevators; unloading material from cars; handling structural steel; general material handling in production and for any job where simple, accurate operation is desirable.

MAIL COUPON TODAY

CURTIS Pneumatic Machinery Co.
1951 Kienlen Ave., St. Louis, Mo.
Branch Office, 518-R Hudson Terminal, New York

Please send me full free information about Curtis Cranes, Hoists, Trolleys and Compressors.

Name .....

Address .....

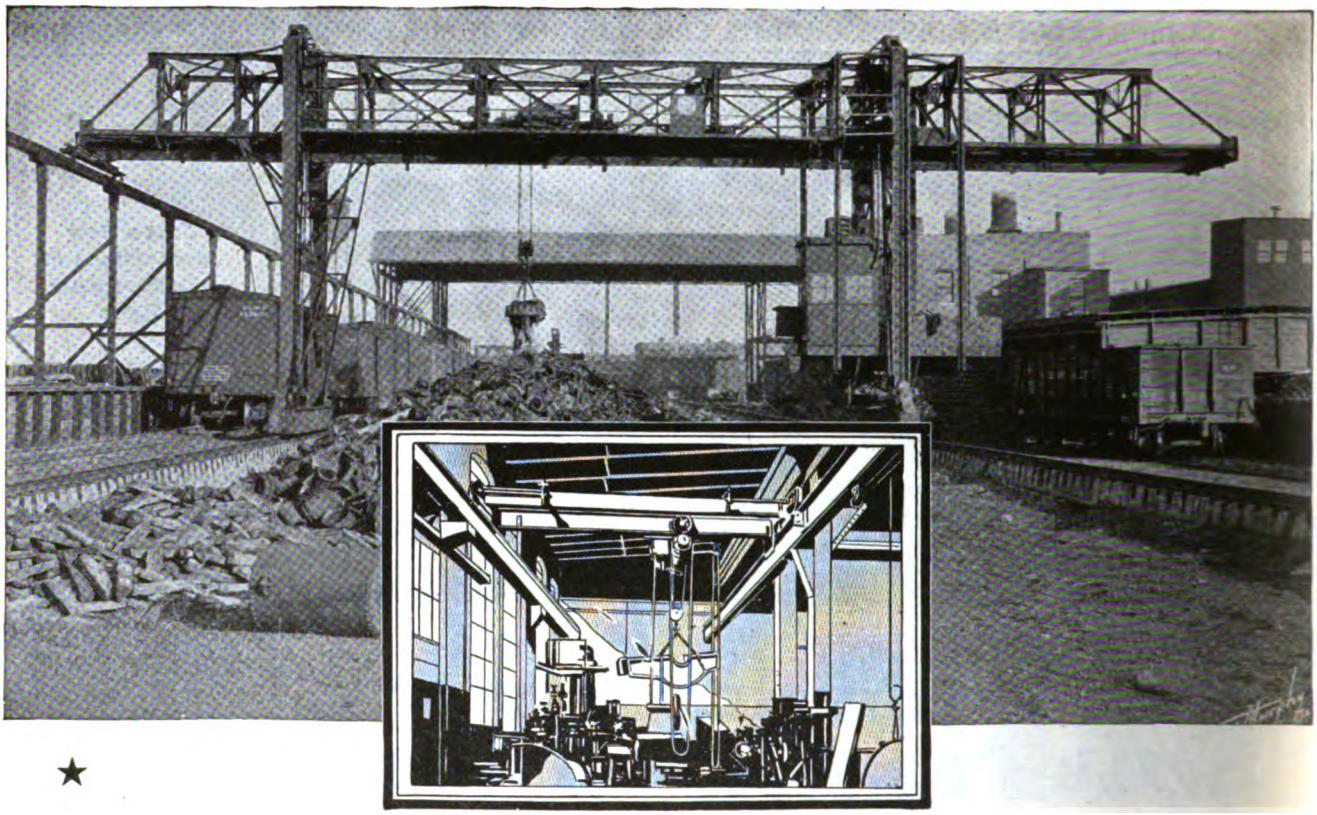
☐ Also send information about Curtis Model "A" Compressors

C-8

CURTIS PNEUMATIC HOISTS CRANES COMPRESSORS

CURTIS PNEUMATIC MACHINERY COMPANY, ST. LOUIS, U.S.A.

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★

Moves in Three Dimensions!

OUT of the maze of material handling equipment offered you let this one fact stand forth clearly: Traveling cranes have the advantage of great freedom of action, since they have a three direction movement—up and down, transverse and longitudinal. Their activity reaches all the area of your plant,—length, breadth, and height. And working from above they require no aisle space for their operation. In addition, they are of use both outdoors and in.

In common with every other kind of material handling equipment, there is one best type of traveling crane for each class of service,—from the little, floor-operated crane to the huge gantry, bridging an entire yard. To select the right type requires expert engineering advice, which the reputable crane builder is glad to offer.

With proper care, traveling cranes often outlast the building in which installed. In terms of "service life" they are the most economical form of material handling equipment.

Before you decide on a specific type of material handling equipment investigate fully the particular advantages (for you) of traveling cranes.

MILWAUKEE ELECTRIC CRANE & MFG. CORP.
Milwaukee, Wisconsin

★ **10-ton Milwaukee Gantry Crane, equipped with magnet, storage platform and weigh pan used in charging cupola at the Griffin Wheel Co., Kansas City, Kansas.**

THE MILWAUKEE CRANE — POSITIVE OIL LUBRICATION

MILWAUKEE

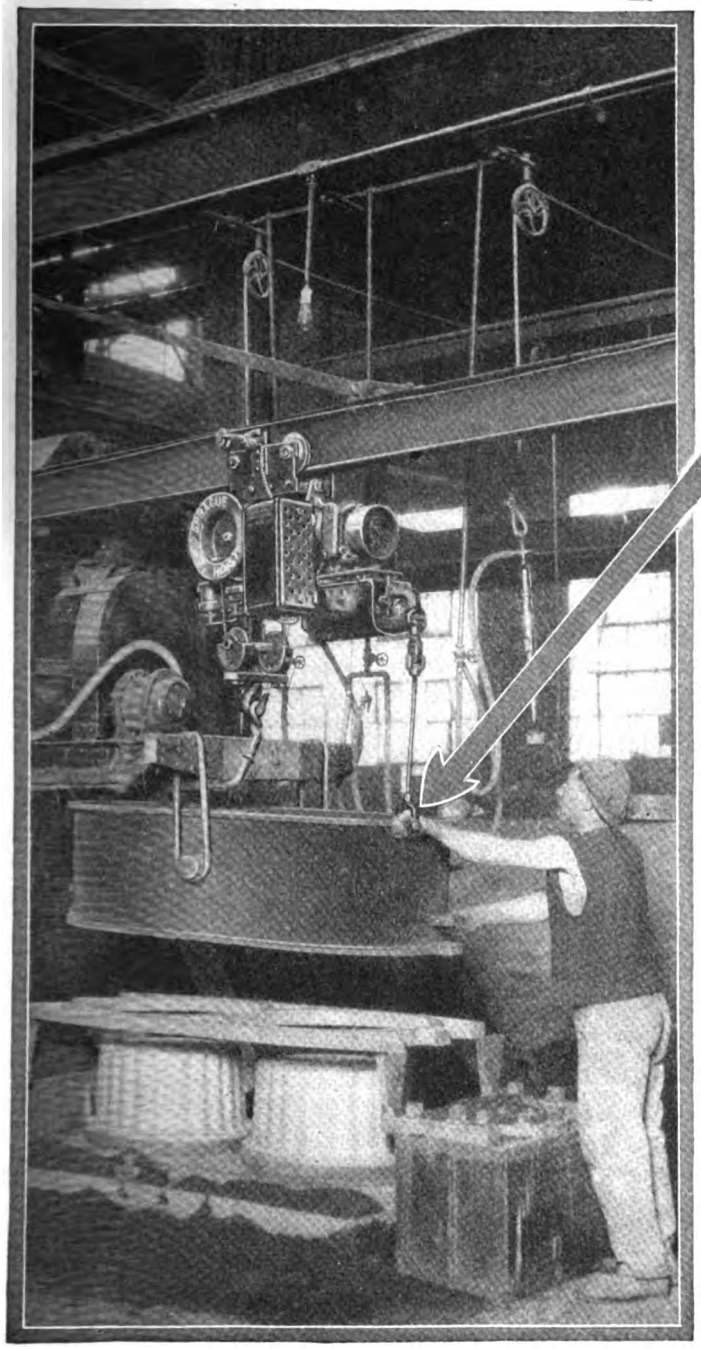
THE TRAVELING CRANE WITH POSITIVE OIL LUBRICATION

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One hand to operate the hoist

one hand free to guide the load





Just a simple twist of the wrist controls the "up" and "down" travel.

Sure, safe, simple single-hand control, freeing one hand which may be used to guide the load.

Sprague Hoists of this type save time and labor in lifting and lowering loads that must be accurately spotted or handled with great care.

These hoists are supplied in capacities of ½ ton to 6 tons. They are worm driven, very simple in construction, thoroughly enclosed and can be counted on for years and years of service.

Let us tell you more about the **advantages of Sprague Rod Control.**

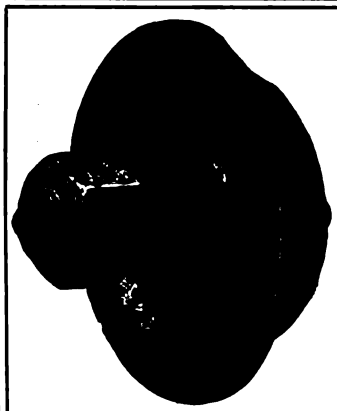
SPRAGUE ELECTRIC HOISTS

DIVISION OF

SHEPARD ELECTRIC CRANE & HOIST CO.

30 CHURCH ST. NEW YORK, N.Y.

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Over 600,000 Now in Satisfactory Use

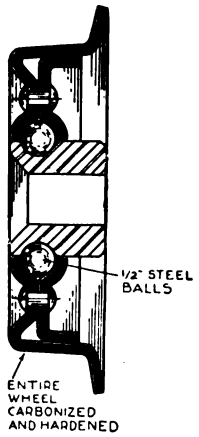
SAGINAW

PRESSED STEEL BALL BEARING

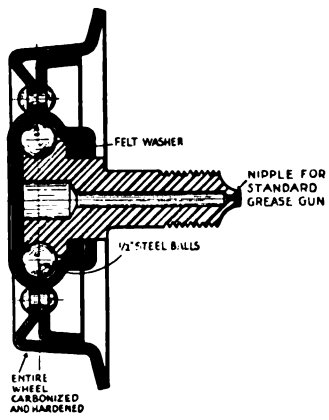
CONVEYOR WHEELS AND TROLLEYS



Brackets and Hangers for All Types of Chain



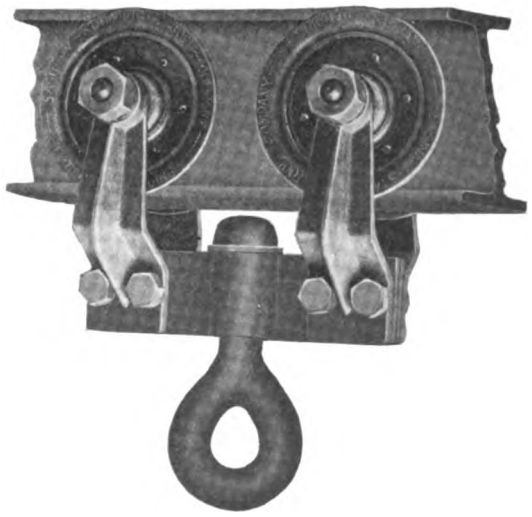
Open Type Wheel



Dust Proof Lubricated Wheel

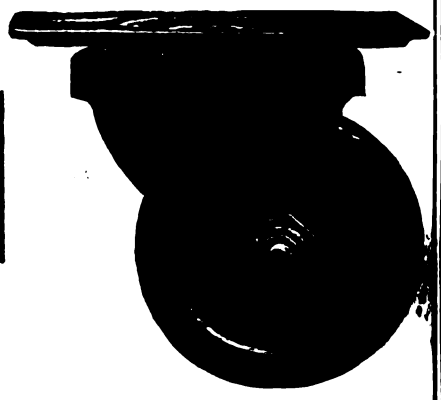
MORE than 600,000 SAGINAW CONVEYOR WHEELS and TROLLEYS for overhead endless chain conveyors are giving satisfactory service in a great many manufacturing plants throughout the country. No other wheel on the market has such a simple rugged construction. SAGINAW wheels are made from only two (2) pieces of heavy No. 11 Ga. steel and the entire wheel is carbonized and hardened so the wear is negligible. ½" steel balls are used in the bearing to eliminate practically all friction particularly under load. Our wheels are made with both OPEN and DUST-PROOF lubricated ball bearings for REGULAR and HEAVY DUTY work on 4, 5, and 6" I-Beams. We also manufacture ball bearing CHAIN HOIST TROLLEYS, CHAIN GUIDE PULLEYS, and BALL BEARINGS for GRAVITY ROLLER CONVEYORS. Write for prices.

RACEAWAY HEAVY DUTY Truck Casters are pressed from heavy steel and cannot break. No sharp corners nor knife edges to dig in and damage floors. DUST-PROOF ball bearing axles and differential and ball bearing swivel make them roll and swivel easy under heavy loads. Made with 4½" and 6" wheels in both RIGID and SWIVEL types. Also REGULAR DUTY pressed steel casters with 3" and 4½" wheels. RACEAWAY casters will speed up your trucks and save your floors. Prices on application.



Made for ½, 1 and 2 ton Capacities

TRADE RACEAWAY MARK



Heavy Duty Pressed Steel Ball Bearing Truck Casters

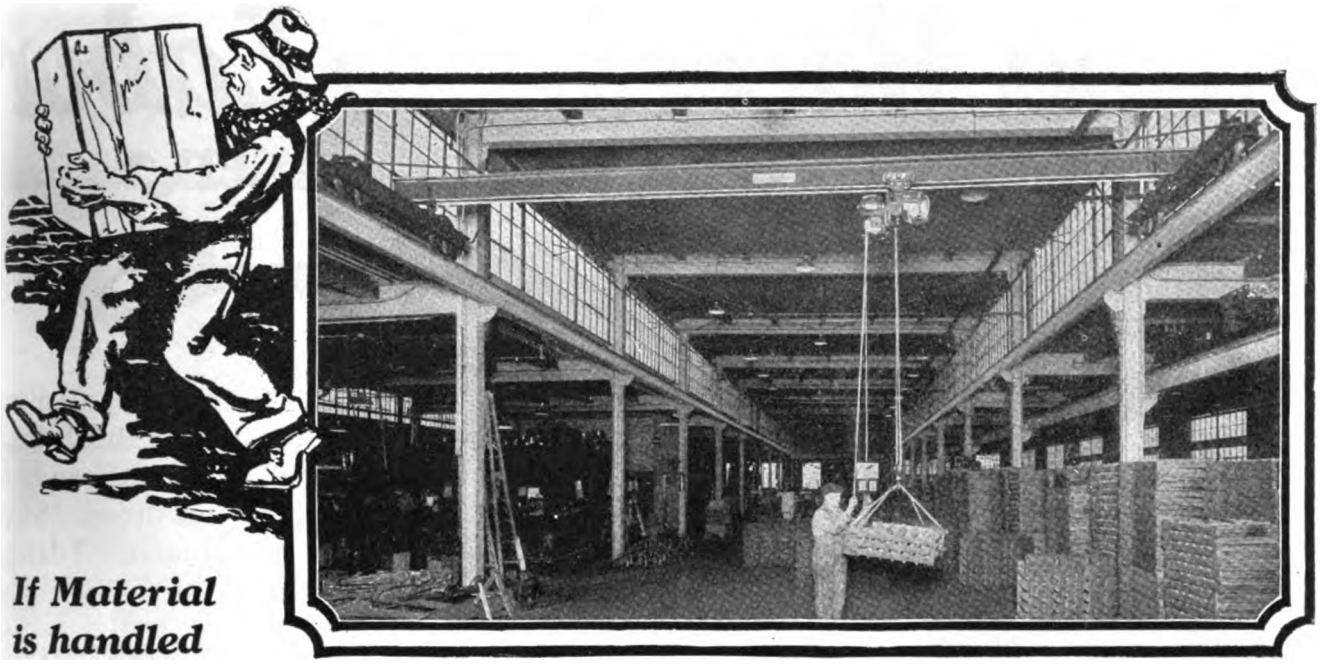
SAGINAW STAMPING & TOOL COMPANY

SAGINAW, MICHIGAN

NEW YORK	PITTSBURGH	DETROIT	CINCINNATI	SALT LAKE CITY	SAN FRANCISCO
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If Material is handled like this in your plant—

Get a "C-M" Idea!

IF the transportation of material in your plant is left to the physical ability of men to lift and carry, your costs are higher than they need be.

In the plant illustrated in the view above, *ONE* man with a "C-M" Electric Hoist and Traveling Crane moves more material with less effort than *FOUR or MORE* men could possibly do by physical effort.

Results

ONE MAN doing the work of FOUR or MORE, thereby releasing three or more men for other work! Faster handling of material; Rock bottom handling costs; And valuable floor space saved because of the ability of the "C-M" equipment to stack material higher than could be done by the combined strength of a gang of men.

Put "C-M" Ideas to work in your plant!

Moving should not be 90% of Making!

DETROIT CONVENTION HALL Sept 19-23 BOOTH No. 348

CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS



"C-M" is the trademark of a complete line of Overhead Material-Handling Equipment backed by an organization ably qualified to apply that equipment correctly to thousands of material-handling conditions. "C-M" Engineering Service is gratis. The "C-M" policy is based on "*Facts* to show YOU the way to MORE PROFIT!" Write for particulars.

THE CHISHOLM-MOORE MFG. CO., Cleveland, Ohio

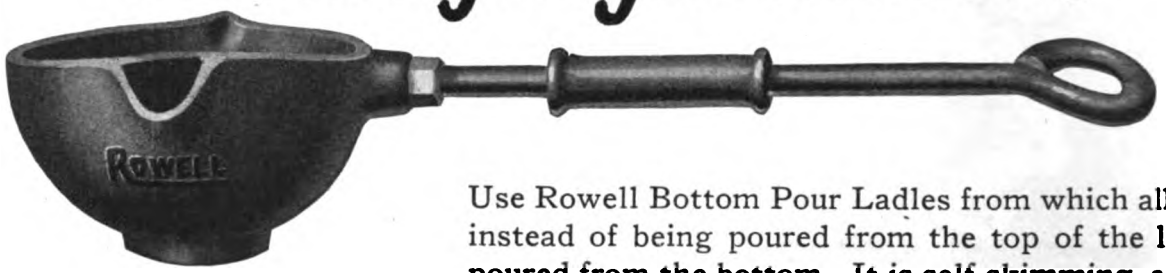
Branches: New York, Chicago, Pittsburgh

Representatives in All Territories for Immediate Service

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Save Material and Labor

With Safety for your Workmen





Use Rowell Bottom Pour Ladles from which all metal instead of being poured from the top of the ladle is poured from the bottom. It is self skimming, and you always have clean metal—no dirt—no dross. Stops loss of metal—and saves labor. Eliminates all danger from explosions due to moisture—*safety for your workmen.*

Let us show you why plants that have metals to pour are rapidly adopting Rowell Bottom Pour Ladles.

ROWELL

ROWELL MANUFACTURING CO.
Appleton, Wisconsin



Saves Its Cost On Every Car Moved 200 Ft.

It costs the purchase price of a Samson Rail Gripper car mover every time you move one or more car an aggregate distance of 200 feet without a car mover. Stop this expense with a Samson. *It lasts a long time*—all parts guaranteed—and you'll be saving money and labor practically every day.

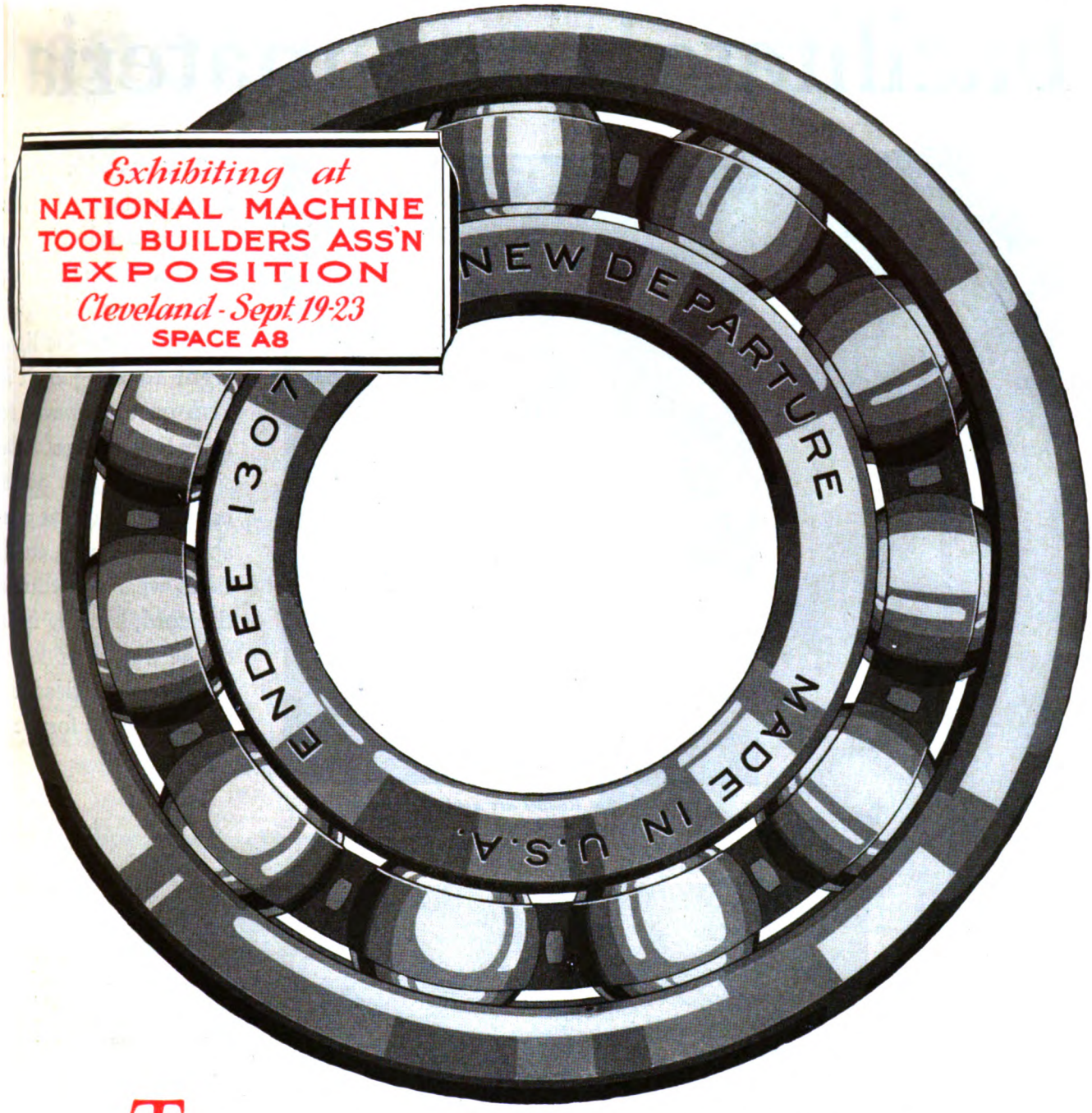
Backed by dependable service to industry for thirty years, the Samson Rail Gripper is today th standard of hand power car movers. It pays to have one handy. *Your dealer can supply you.*

G. D. ROWELL & SON, Appleton, Wisconsin

Samson RAIL GRIPPER

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TIME waste causes the greatest loss in industry.

Material handling machinery best simplifies this problem when equipped with New Departure Ball Bearings.

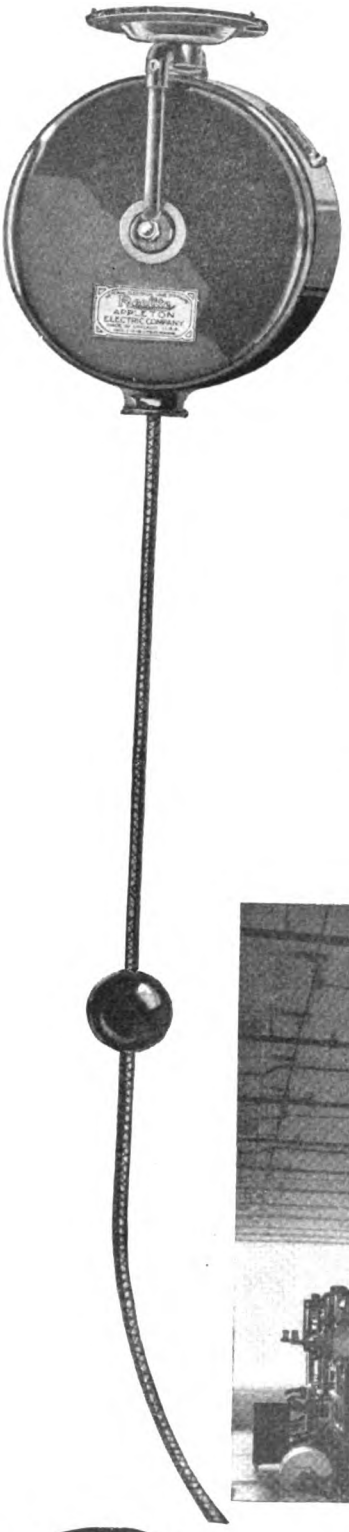
Data on conveyors, hoists, elevators, trolleys, cranes, etc., furnished without obligation by the Engineering Department of the New Departure Manufacturing Company, Bristol, Connecticut.

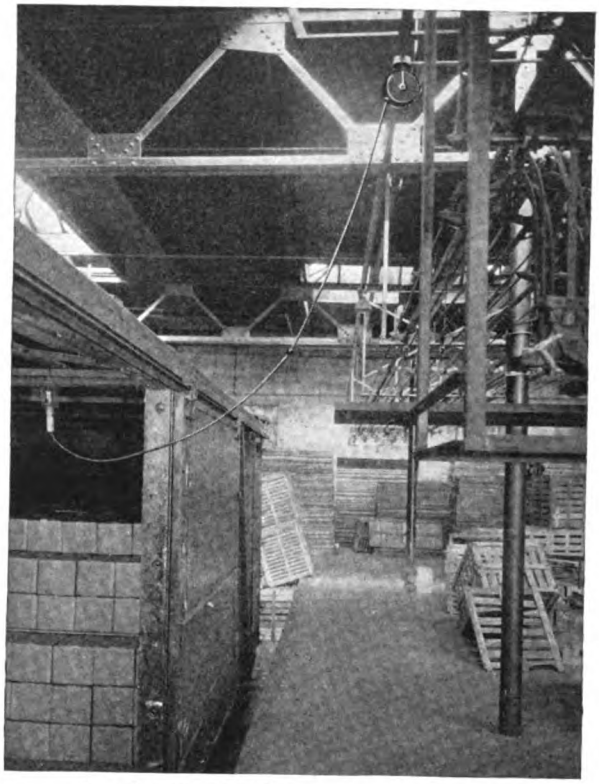
New Departure Quality Ball Bearings

691

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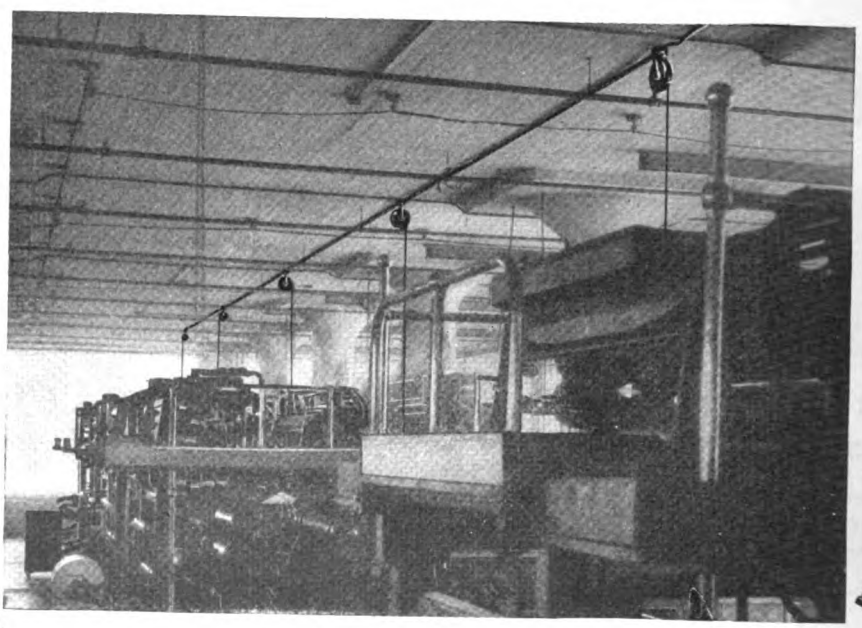
Facilitate your material





Portable-type Reelites are used to speed up freight loading at the shipping platforms of the Continental Can Company's Clearing Works

The portable type of Reelite shown on this page is used chiefly to facilitate the handling of materials by bringing the best possible light right to the job. It is also used, however, to carry low voltages to the smaller types of power equipment such as portable drills, saws, etc. It saves wear and tear on the cord, keeping it out of the way of workmen, off the floor, clean, unkinked, ready for use at all times.



Reelites used in the press room of the Edw. Langer Printing Co., Jamaica, N. Y.



Reelite

REG. U. S. PAT. OFF.

The Handy Light on a Reel

For pr... ...ised in this issue write Industry Illustrated

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handling with Reelite

Wherever electric machines *move*—Reelite *saves!*

1. Saves wear and tear on the cable that feeds current and thus saves its cost (often in as little as a year).

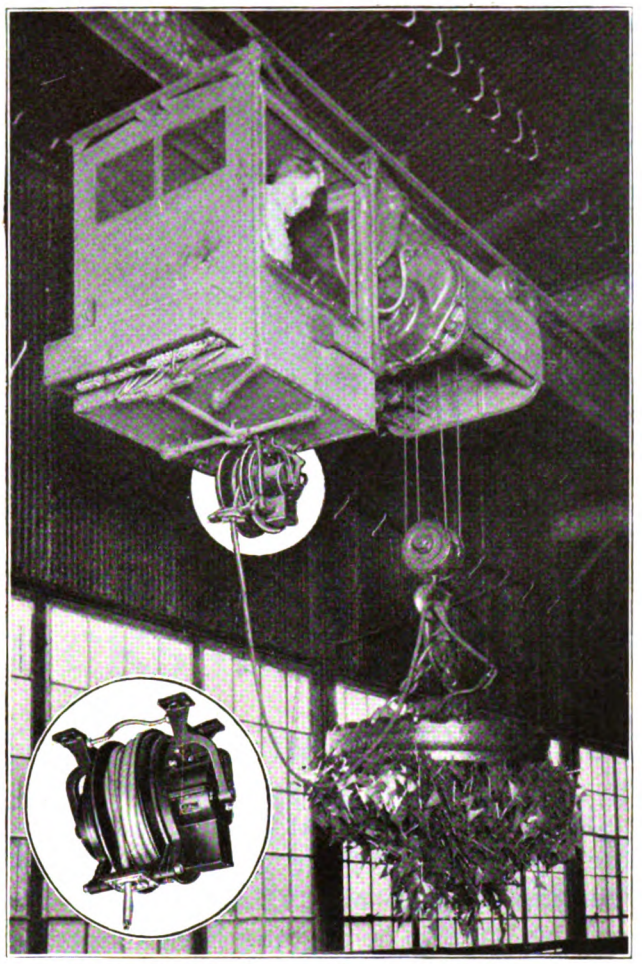
2. Eliminates the danger of bare rails and wires, thus safeguarding employees.

3. Saves time of workmen and releases, for other duties, men who have been tending cable.

For Reelite carries current wherever it's needed—to traveling cranes, lifting magnets, boring mills, portable hoists and mobile transfer cars.

Cable is paid out and retrieved just as needed—never too little, never too much, no slack, no undue tension, no appreciable wear.

Send for this new, profusely illustrated bulletin which shows all models. It will point the way to operating economies you have never known before.



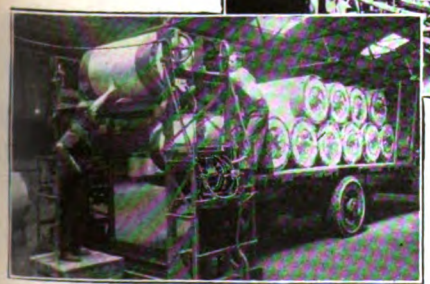
Constant Duty Reelite as used on Lo-Hed Hoist made by American Engineering Co., Philadelphia, Pa.



Constant Duty Reelite with Ball Ring Cable Outlet as Used in Connection with Lifting Magnet by Cohen Iron & Metal Company, Milwaukee, Wisc.



Constant Duty Reelite with Swivel Cable Outlet as Used on Sand Cutting Machines Made by American Foundry Equipment Company, Mishawaka, Ind.



Constant Duty Reelite with Ball Ring Cable Outlet as Used in Connection with Electrically Operated Portable Elevator in Paper Stock Room of a Large Newspaper.



CONSTANT DUTY

Reelite

REG. U. S. PAT. OFF.

Carries Current Where Needed

APPLETON ELECTRIC CO.
1716 Wellington Ave., Chicago

Gentlemen:

Please send us a copy of your new Bulletin 501-S, together with prices and discounts.

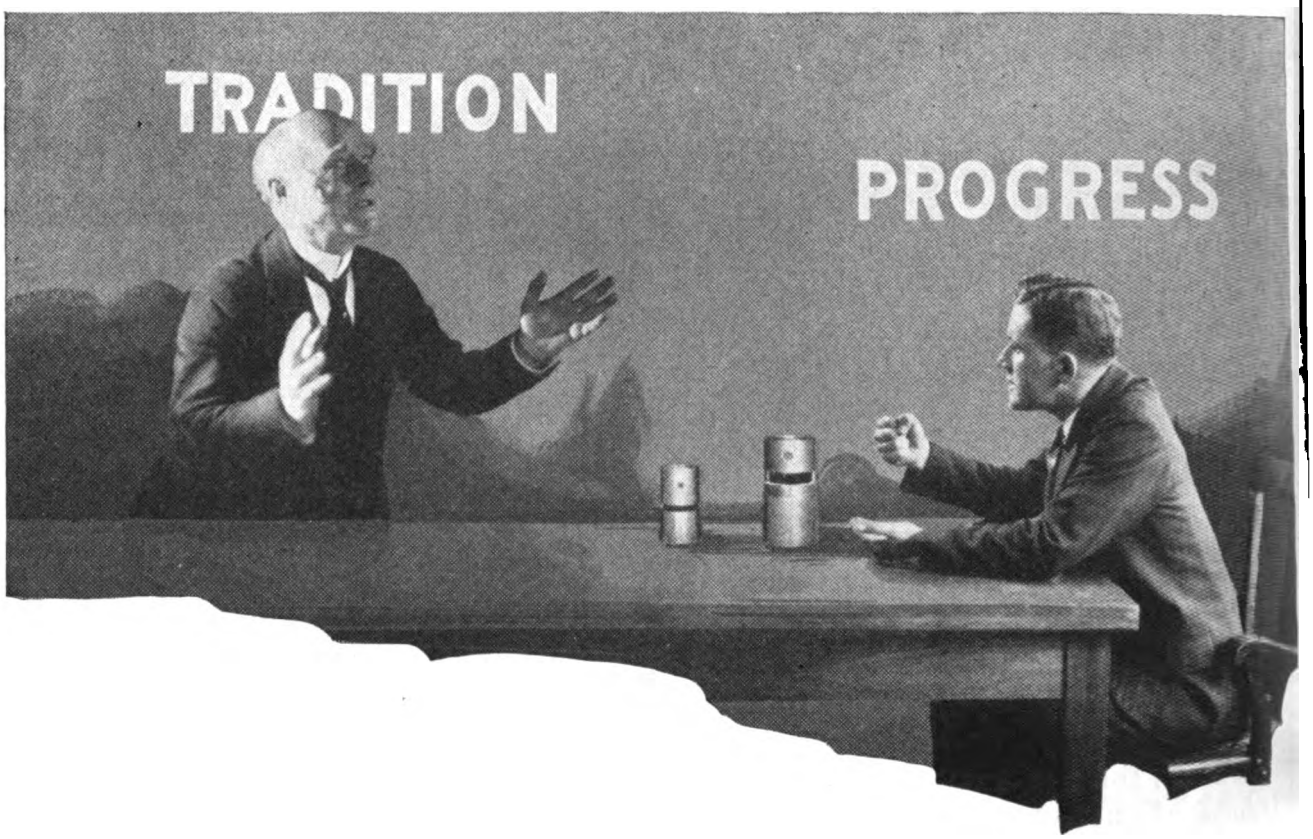
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*Address*_____

*City*_____ *State*_____

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Pop asks how it happened



"Here, Lad—

if you would spend more time looking after the motors that we've got and less time trying to have me get this new-fangled motor the next time I buy—we wouldn't have to be arguing here about the amount of money it costs us to keep motors going. How does it happen that this motor of yours suddenly becomes a world beater?"

"Easy, Pop—

it didn't happen. The best things never happen—they're achieved.

The 'Linc-Weld' people didn't happen on bearings and shafts that are bigger than those of any other motor.

Being motor specialists they knew years ago that these items cause the most trouble in motor operation—so they deliberately developed these to a point where these troubles were licked.

By accurate logging of our motor shut-downs, 75% were directly the result of bearing failure.

So I'm simply asking you, Pop, to look at these two bearings—

The little fellow is ours—the big brute is the 'Linc-Weld,' and tell me which you'd choose if your life and not your prejudices were at stake on the final outcome in service?"

The Lincoln Electric Co., Dept. No. 17-8, Cleveland, Ohio

MA-1

"Linc-Weld" LINCOLN MOTOR

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Metzgar Heavy Duty Truck Wheel, showing Hyatt Roller Bearing in hub. Hyatt equipped Metzgar Wheels are specified where economy and long life are desired. Manufactured by the Metzgar Co., Inc., Grand Rapids, Mich.

Hyatt equipped trucks are popular

MOST prominent builders of trucks, trailers, and truck wheels furnish Hyattized equipment because Hyatt Roller Bearings can be depended upon for uninterrupted service throughout the life of the truck no matter how abusive the working conditions.

Hard daily poundings mean nothing in their long lives. The sturdy Hyatt rollers are built to absorb these shocks, and keep them from racking the truck and its load.

Hyatt Roller Bearings, with their easy rolling motion, are practically frictionless and conserve power. They are easier on the men as well as the trucks.

Faster, smoother, steadier material handling is inevitable.

In winning and holding the confidence of leading truck and truck wheel manufacturers Hyatt again has justified the importance of building truck performance and profits from the bearing points.

HYATT ROLLER BEARING COMPANY

NEWARK CHICAGO PITTSBURGH DETROIT
OAKLAND WORCESTER CLEVELAND PHILADELPHIA

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

When writing advertisers please mention Industry Illustrated

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In the game of WASTE friction always WINS!

You wouldn't sit in a game where the cards are stacked . . . or throw a set of loaded dice . . . and hope to win! Neither can your plant play a part in the game of WASTE and expect a winning hand. Friction attends to that!

THIS was the conclusion a large Southern textile mill* reached recently when it decided to replace all plain bearings on line shafting with Skayef Ball Bearing Hanger Equipment.

In order to determine the actual savings effected by Skayef Hanger installations, the mill employed a firm of engineers to make an unbiased report of their findings. Full and light power load readings were taken in a series of tests conducted both *before* and *after* the Skayef installations. This corps of engineers found that friction reduction through Skayef Hangers on line shafting caused a resulting 15.5% *decrease* in the power load; that lubrication and maintenance labor costs were reduced 97%; that the total yearly saving in power, labor and lubricant alone amounted to $2,019.48!

No plant running on plain bearings can play a winning hand in the game of waste. Put your friction reduction problems up to SKF.

*A certified survey in portfolio form showing detailed savings effected by Skayef Hanger installations in seventeen representative industries will be sent on request.



1866

SKF

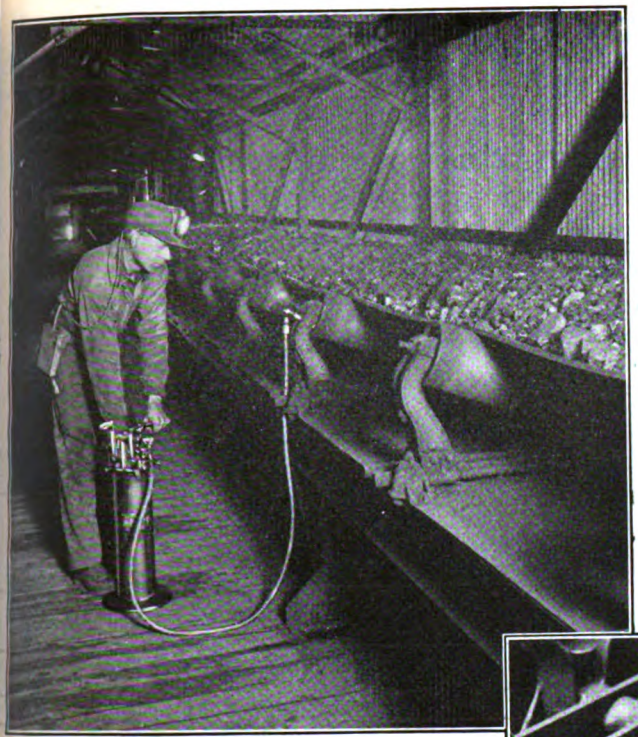
MARKED

Self-Aligning **HANGERS** *Ball Bearing*

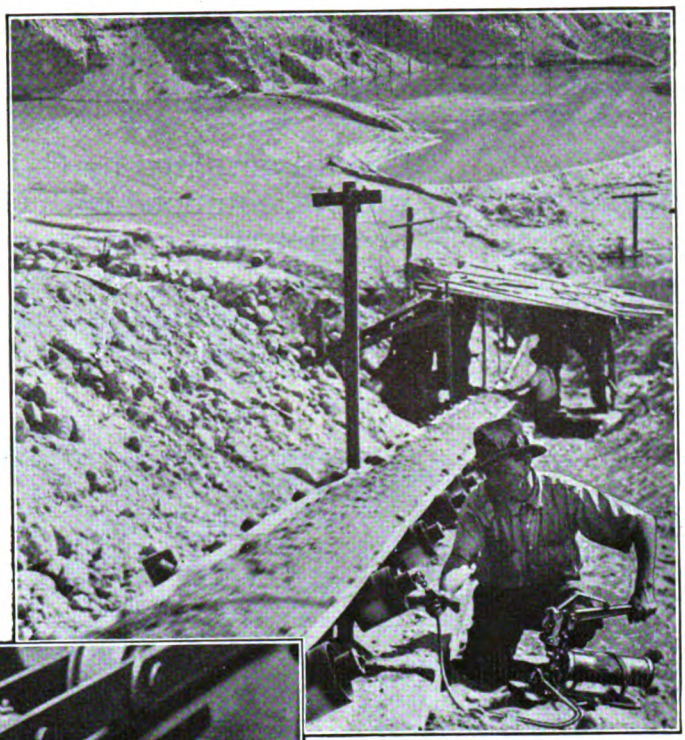
SKF INDUSTRIES, INC. S. E. cor. Madison Ave. at 34th St. ~ NEW YORK CITY

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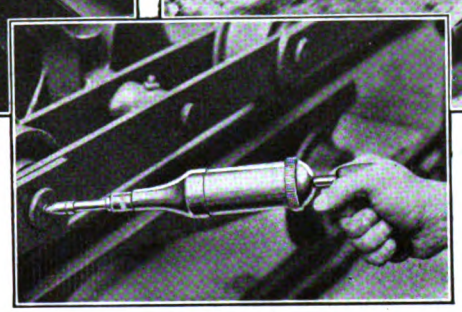
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Lubricating the longest coal conveyor in the world by means of the positive, safe, economical Alemite System. This conveyor is 4½ miles long and is equipped with over 50,000 Alemite fittings. It has been operated steadily for over three years with practically no bearing renewals



Lubricating a long sand conveyor with portable Alemite Compressor. One stroke of the handle flushes the bearing and fills the reservoir with clean lubricant through the dustproof Alemite fitting



One thrust of the Alemite-Zerk compressor thoroughly lubricates a bearing on this rolling conveyor chain

Right now!

Alemite Lubrication is cutting down the cost of operating materials handling equipment

Enormous savings are being effected today by the use of modern materials handling equipment.

But still greater savings are being made where such equipment is lubricated by means of the easy, positive, economical Alemite High Pressure Lubrication System.

Alemite lubrication cuts down the cost of operating materials handling equipment because:

1—It greatly lengthens the life of the machine, as it never fails to put the lubricant where it belongs—*in the bearing.*

2—It reduces power costs because positive lubrication means easier running machinery.

3—It cuts down labor cost of lubricating.

4—It requires less lubricant.

5—It decreases shut-downs since practically all bearings can be lubricated without stopping the machinery.

6—It reduces overhaul and repair work.

7—It invites regular, systematic lubrication because of the ease and safety of application.

These are some of the reasons why the Alemite High Pressure Lubrication System is being installed as standard equipment on the majority of materials handling devices; why you should be sure to specify "Alemite lubrication" on all new machinery you buy. We have a trained corps of lubrication engineers who will be glad to discuss your lubrication problems with you without obligation. And we have a magazine—"Alemite Industrial Lubrication"—which we will be glad to send you regularly on request. Just check and fill in the coupon below.

THE BASSICK MFG. CO.
2650 N. Crawford Avenue, Chicago, Ill.

Canadian Address: Alemite Products Company of Canada, Ltd., Belleville, Ontario

Manufacturers of

The Alemite Bayonet Type System
The Alemite Button-Head Type System
The Alemite-Zerk Type System

ALEMITE

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High Pressure Industrial Lubrication

Bassick Mfg. Co., 2650 N. Crawford Ave., Chicago, Ill.
Please send me, without obligation on my part
☐ Further information about the Alemite System.
☐ Alemite Industrial Lubrication.

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Operating a World of Crane

Cranes actuated by G-E alternating- or direct-current motors, equipped with G-E solenoid brakes and manual or automatic control, assure great power so precisely controlled that marvelous swiftness, accuracy, and safety in handling materials are obtained—and costs are lowered.



G-E engineers, experienced in equipping every conceivable type of crane, cooperate with leading manufacturers of electric cranes to help you with your problems, however difficult. Ask your nearest G-E office for complete information.

Typical A-c. Motors, Sc Brakes, and for Cranes.

Motorized Power
—fitted to every need

GENERAL

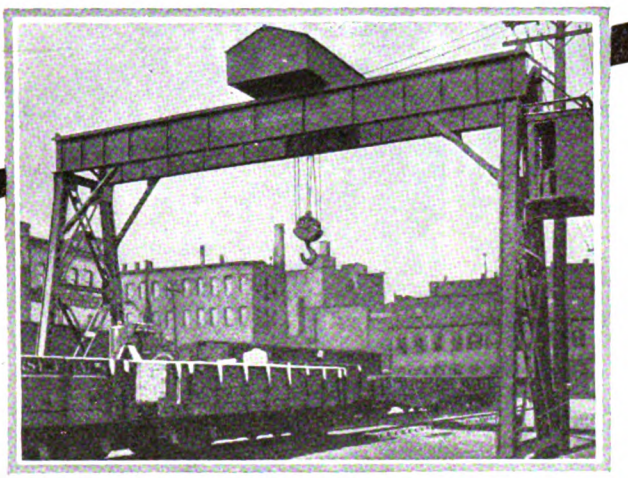
GENERAL ELE[illegible] COMPANY, SCHENECTADY, N. Y.

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with G-E Motorized Power



Traveling Boom Crane



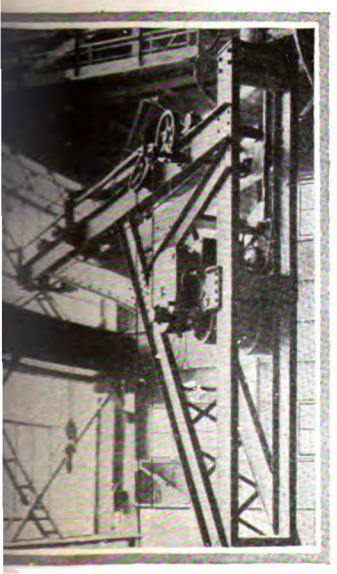
Gantry Crane



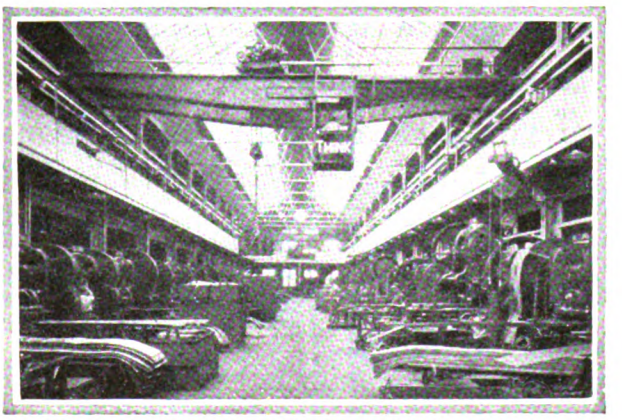
Cargo-handling Crane



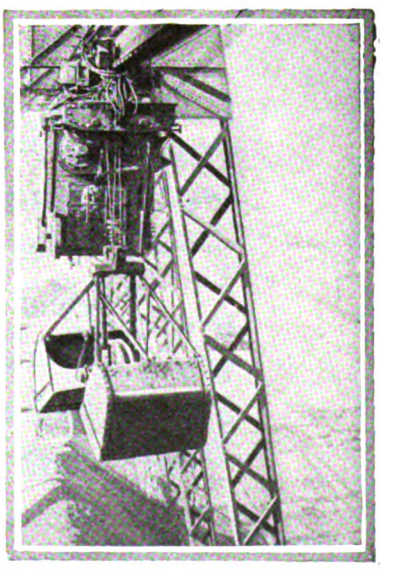
Hammerhead Cranes



Jib Crane



Overhead Traveling Crane



Monorail Crane

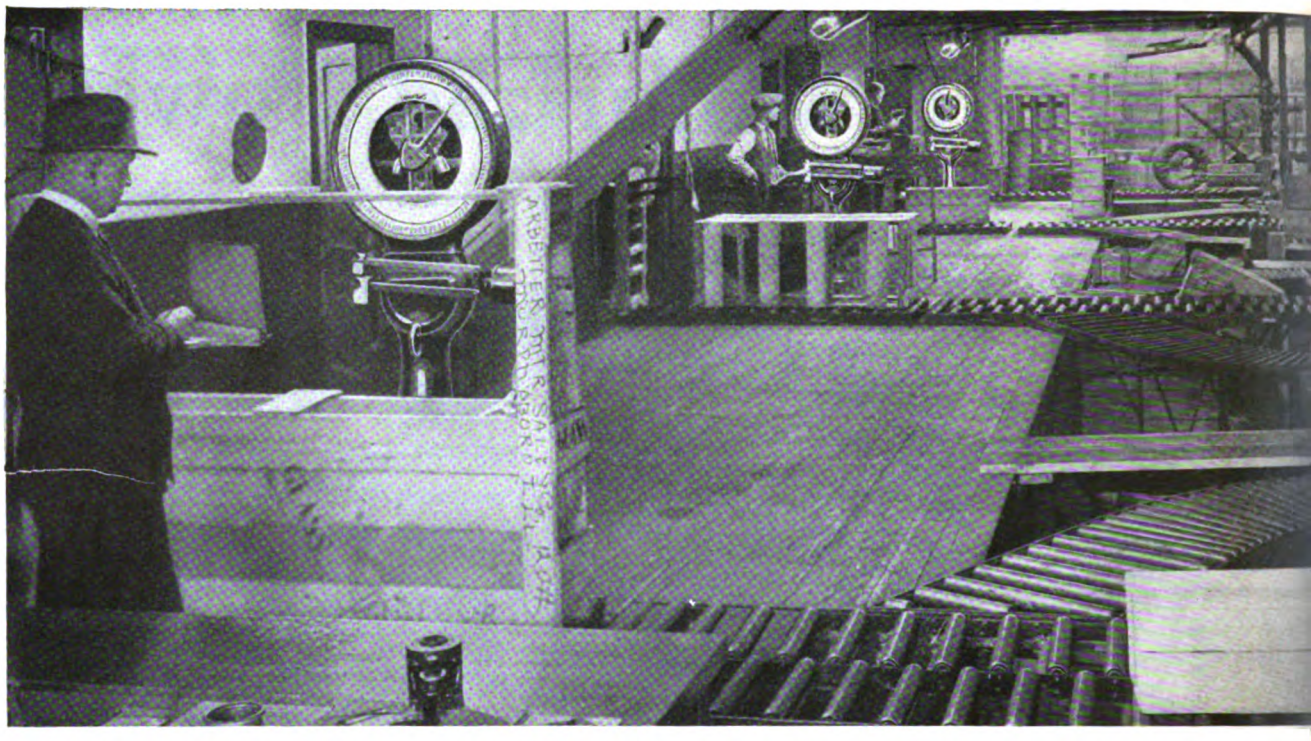
Typical Installations of Electric Cranes—G-E Equipped

200-98

ELECTRIC

SALES OFFICES IN PRINCIPAL CITIES

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Materials *Weighed* on the Go

Whether your materials are handled by conveyor, by overhead track, by flow, by factory railroad, by hand truck, power truck or motor truck, there is a model of Toledo Automatic Scale to fit into your handling equipment. It tells you the weight of material "on the go" by a glance at an automatic dial from five to seven feet in circumference. It saves dollars by eliminating human error and saves hours by eliminating hand operations. Scales for weighing materials from 1-1000 ounce to 60,000 pounds, liquid or solid. Scales for counting. A Toledo man will study your requirements. Write us.

Toledo Scale Company, Toledo, Ohio

Canadian Toledo Scale Company, Ltd., Windsor, Ont.

World's Largest Exclusive Manufacture of Au tic and Computing Scale

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ESTABLISHED 1912

PLIMPTRUCK

B.E SCRIVEN PATENTS

STABLE AS THE PYRAMIDS

The LIFT TRUCK with the Knuckled Steering Wheels



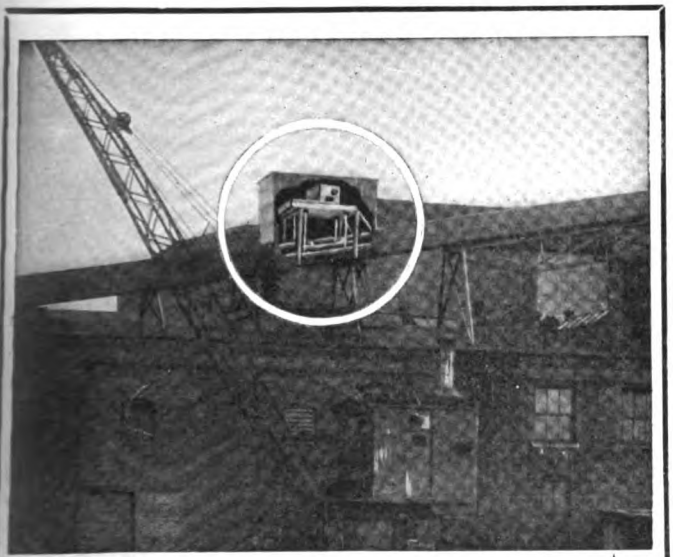
Wide spread wheel spacing and 4-point support prevent load from swaying or tipping and speed up the load handling.

The symmetrical design enables load weight to be evenly distributed, ensuring an equal strain on each of the four wheels.

Open rectangular lifting frame raises the weight dipped platforms cradlewise, without disturbing the goods.

Platform legs raise and lower in vertical alignment with wheels having all "High Lift" clearance advantages with the least lifting effort and elevation.

The Plimpton Lift Truck Corporation
Stamford, Conn.



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? **Your bills** of lading are not always correct. The chance for **error is** always present.

Conveyors equipped with Merrick Weightometers are assured **of an accurate** check on all conveyor handled materials—99% **accuracy** guaranteed—ore, sand, stone, gravel, coal, coke, fin**ished cement**, etc. The weighing is done while the materials **move along** and the weights recorded. It is ideal for checking **receipts,** shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.

Something
for
Nothing

IT isn't very often that you can get something worth while without paying for it. Here is the exception.

The Bulletin we have just published covers the most important phase of industrial handling — The transporting of heavy loads CHEAPLY. It's a really worth while book.

The illustrated uses of the Tier-Lift Truck are many and varied. The types of trucks shown cover every conceivable industrial need.

It costs you nothing. The Bulletin number is 35-A. Why not send for it?

The
Lakewood Engineering Company
12550 Berea Road
Cleveland, Ohio

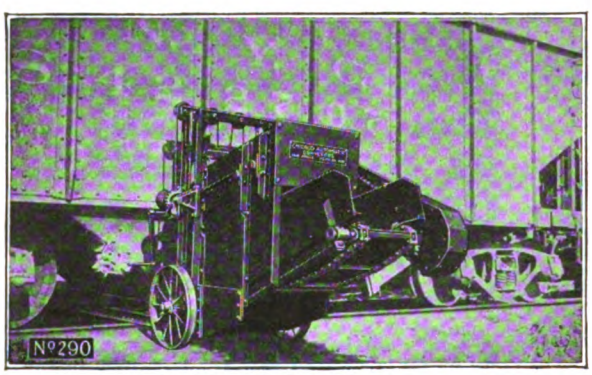
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CHICAGO AUTOMATIC

Conveyors and Track Unloaders Make Possible a Ton a Minute Car Unloading

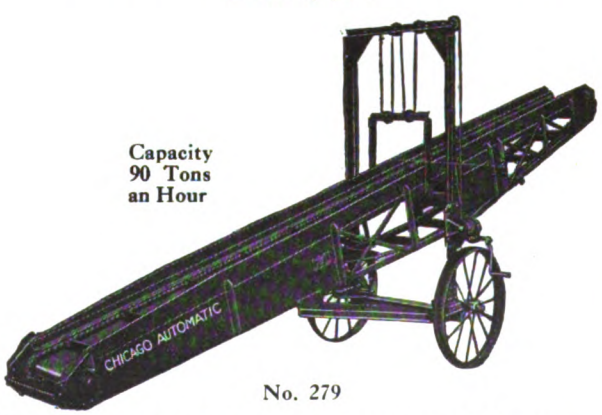


Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use
90 tons an hour is the capacity of both machines



The Model T. U. goes under any car and handles all classes of fuel

Capacity
90 Tons
an Hour



No. 279

This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

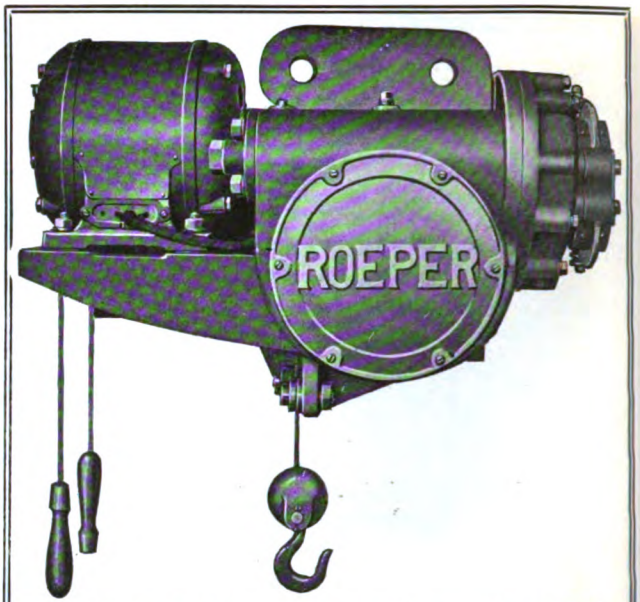
Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable conveyor

982 Old Colony Bldg. Chicago

Representatives desired for several Industrial Centers



ROEPER Electric Hoists with Steel Plate Suspension

Two wrought steel plates in which drum shaft has its bearings, project above hoist, and can be extended and shaped to meet any requirement.

Write us for more details

ROEPER CRANE & HOIST WORKS, Inc.

1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys



SPOT CARS THIS WAY

One man can spot loaded or empty cars quickly and easily with a New Badger Car Mover. Your crew wastes no time in waiting for the switch engine to move cars to and from the docks. Work continues with hardly any delay. A New Badger will pay for itself in a short time through time thus saved. Order from your jobber.

THE ADVANCE CAR MOVER CO., Appleton, Wis.

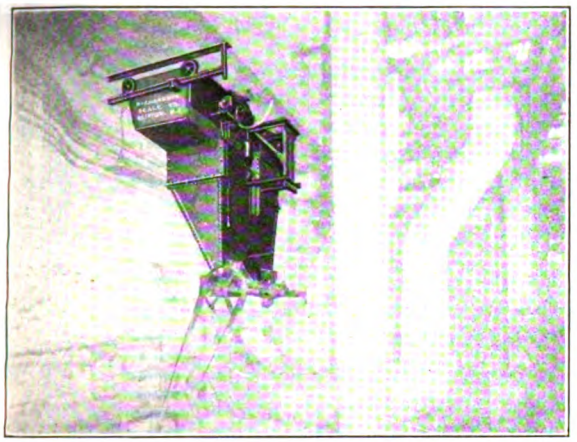
New Badger

SLIP PROOF CAR MOVERS

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RICHARDSON COAL SCALES

at the Pennsylvania-Ohio Power & Light Company



Also used by

Vacuum Oil Company
Standard Oil Company
American Gas & Electric Co.
Dodge Brothers
Carnegie Steel Company
American Steel & Wire Co.
The Kellogg Company
Hudson Coal Company
Solvay Process Company
etc., etc.

Automatically weigh coal to pulverizers with uniform accuracy and give those essential and vital records of fuel consumption.

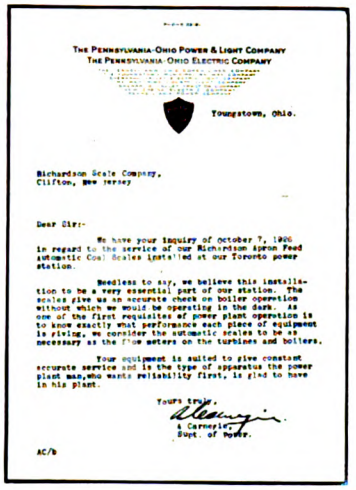
Proper records aid materially in maintaining the highest efficiency.

Note the names of a few of the hundreds of users of the

Richardson Apron Feed Coal Scale!

Install one in *your* Boiler Room and enjoy the economies that result from the installation.

Let us send you our Bulletin 1224-H



The Pennsylvania-Ohio Power & Light Company
The Pennsylvania-Ohio Electric Company

Youngstown, Ohio.

Richardson Scale Company,
Clifton, New Jersey

Dear Sirs-

We have your inquiry of October 7, 1926 in regard to the service of our Richardson Apron Feed Automatic Coal Scales installed at our Toronto power station.

Needless to say, we believe this installation to be a very essential part of our station. The scales give us an accurate check on boiler operation without which we would be operating in the dark. As one of the first requisites of power plant operation is to know exactly what performance each piece of equipment is giving, we consider the automatic scales to be as necessary as the flow meters on the turbines and boilers.

Your equipment is suited to give constant accurate service and is the type of apparatus the power plant man, who wants reliability first, is glad to have in his plant.

Yours truly,
A Carnegie
Supt. of Power.

AC/b

RICHARDSON SCALE COMPANY

CLIFTON, NEW JERSEY

Boston New York Chicago Minneapolis Philadelphia Pittsburgh

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



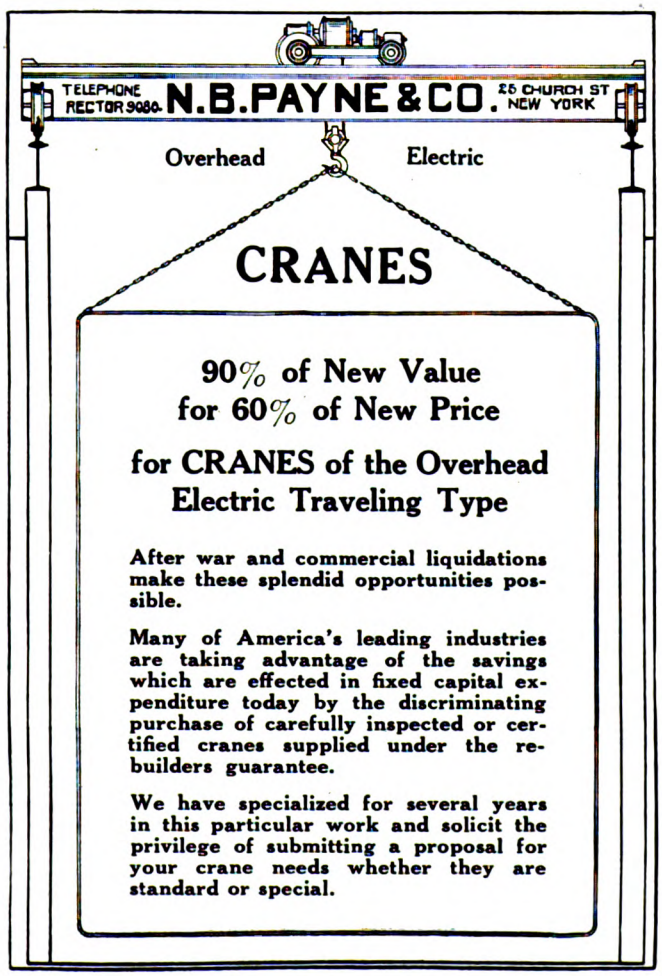
The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street



90% of New Value for 60% of New Price

for CRANES of the Overhead Electric Traveling Type

After war and commercial liquidations make these splendid opportunities possible.

Many of America's leading industries are taking advantage of the savings which are effected in fixed capital expenditure today by the discriminating purchase of carefully inspected or certified cranes supplied under the rebuilders guarantee.

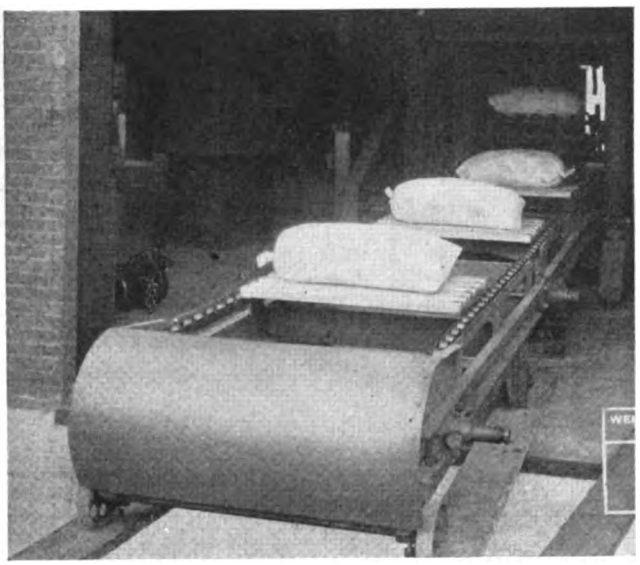
We have specialized for several years in this particular work and solicit the privilege of submitting a proposal for your crane needs whether they are standard or special.

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WELLER MADE CHICAGO

Elevating and Conveying Machinery

Helps to Reduce Overhead



The above shows part of a bag handling system installed in the plant of The Standard Warehouse and Milling Co.

We make a complete line of equipment for the mechanical handling of all kinds of materials and finished products.

Submit Your Problem

Competent engineers will assist you in selecting equipment best adapted to your requirements.

We also design and make

Coal and Ashes Handling Machinery

WELLER MFG. CO.

1820-1856 N. Kostner Ave.
CHICAGO
New York Office, 50 Church St.

Let WELLER *quote on your requirements*

POWER

The moving of heavily loaded cars requires a great amount of power.

The very appearance of the Atlas Car Mover suggests power. Its scientific construction develops power, sufficient to move the heaviest cars and still have a margin of reserve.

Its positive grip spurs never fail to hold and assure perfect safety.

A locomotive as far as practical results go, it places cars with an astonishing speed and ease.

OUR POLICY IS TO SELL THRU THE JOBBER



The Famous

ATLAS CAR MOVER

Manufactured Only by

Appleton Car Mover Co.
Appleton, Wis.

A DEPENDABLE SOURCE OF SUPPLY

GITS BROS.

Better Oilers

287 Styles & Sizes



OIL CUPS
OIL HOLE COVERS
WIRE WICK FEED OILERS
OIL RESERVOIR FILLERS

Quality Oil Cups for Every Purpose

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Screw "LENOX" Drivers



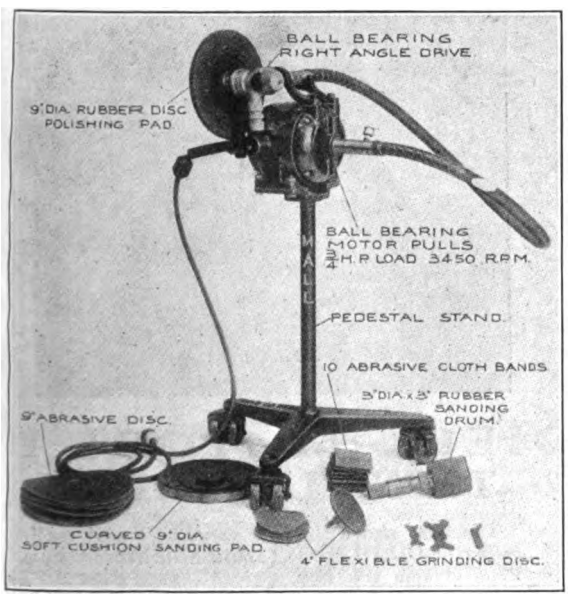
Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

Points are heat treated to stand the strain without bending. And the handles cannot loosen.

Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

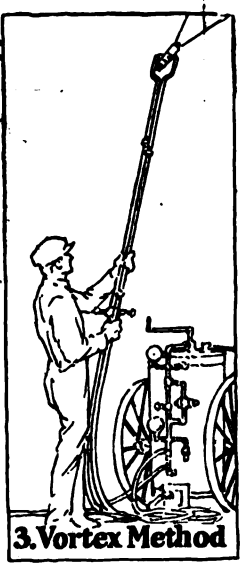
AMERICAN SAW & MFG. CO.
Springfield, Mass.
"The Tools in the Plaid Box"

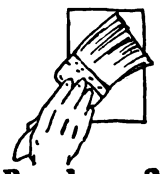


Type D-3 No. 146 Mall Ball Bearing Flexible shaft machine used for Filing, Drilling, Glass edging, Grinding, Metal finishing, Polishing, Sanding and Buffing—(A thousand applications.) *Write for Catalog*

MALL TOOL COMPANY
7726 So. Chicago Ave. Chicago

3 ways to PAINT





1. Brush 2. Ordinary Gun 3. Vortex Method

Have you overlooked the Quick Economical Way?

THERE are three kinds of large area painting—[1] brush painting, [2] gun painting, [3] Vortex painting.

The Vortex equipment excels the ordinary gun, just as much as such a gun excels the brush in speed and economy.

Vortex equipment is not sold. It is furnished without cost to users of Vortex paint.

Painting Equipment is Loaned

Vortex paint is fine paint, prepared for every variety of painting equipment. But we just naturally like to help solve your problem—to make it easy for the paint to get where you want it—on the wall. The coupon below is your key to better and more economical painting.

THE VORTEX MANUFACTURING COMPANY
1977 West 77th Street · · · · Cleveland, Ohio

Vorcolite

and the VORTEX PAINTING METHOD

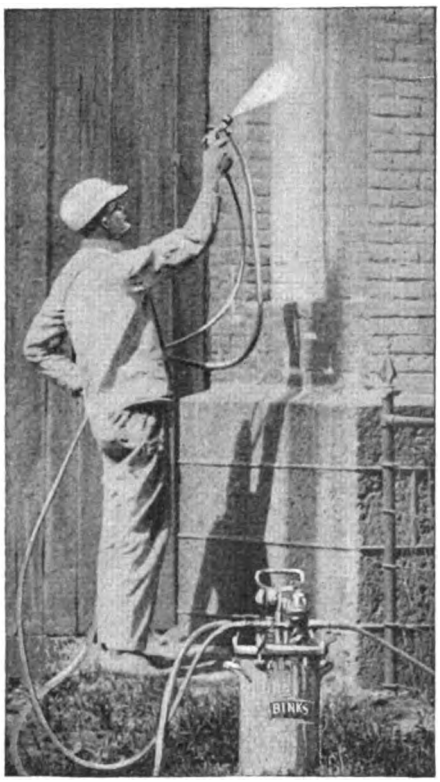


Fill out and mail

VORTEX MFG. CO.
1977 West 77th St., Cleveland, Ohio
Please send us check sheet to outline our painting problem. It is on new construction?____ Buildings already in use?____
Company .....
Address .....
Attention .....

V-33

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How Spray-Painting Lowers Your Maintenance Costs!

It is the difference of painting by hand and painting by machine. The machine method is 4 to 5 times faster, requires less man power, and does not stop production while repainting is going on. The machine method of painting also does a better job. The force of the spray does more than cover the surface; it penetrates cracks, crevices on rough and splintered surfaces—it leaves no brush marks. And the Binks Spray Gun can handle any painting material a brush can.

Pays for Itself in What It Saves

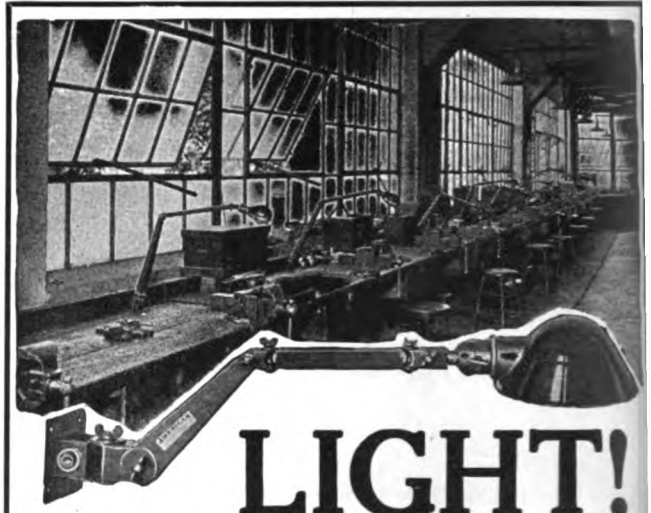
Any factory or institution of fair size can pay for the cost of a Binks Portable Spray-Painting outfit in one painting, then have the equipment for all future use. It will show a return on the investment that will surprise you. Our engineering department will gladly supply you detailed information on your particular painting needs. Address:

BINKS

SPRAY EQUIPMENT CO.

Dept. H 3133 Carroll Ave., Chicago, Ill.

Offices in Principal Cities



LIGHT!

A Guarantee of Greater Production . . . .

Made in Six Styles and many sizes. Can be furnished with flat bracket or conduit fixtures.

American Adjustable Fixtures give correct localized lighting and thus speed production.

They are attached directly to machine or bench, or they can be hung from wall or ceiling.

Write for full details.

American Fixture Company

230 West Water Street Milwaukee, Wis.



DIEHL MOTORS IN TEXTILE MILLS

The view above shows a very successful application of DIEHL IDT Textile Mill Motors by a Pennsylvania silk mill.

Diehl motors give a sure, steady, dependable flow of power that will keep not only textile equipment but all kinds of general and special machinery in service.

Let DIEHL engineers help you with your motor problems.

DIEHL MANUFACTURING CO.

ELIZABETHPORT, N. J.

ATLANTA BOSTON CHICAGO NEW YORK PHILADELPHIA

DIEHL

ESTABLISHED 1888

advertised in this issue write Industry Illustrated

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We Originate and Build

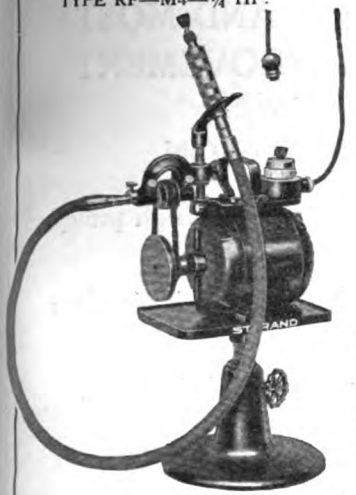
Strand
FLEXIBLE SHAFTS

Twenty-two Years In This Industry

ESTABLISHED 1905

A NEW DEVELOPMENT

TYPE RF—M4—¼ HP.



Here is a machine that will be appreciated by every mechanic who has anything to do with the finishing of dies or similar work—

ROTARY FILING
GRINDING
AND POLISHING

Simply attach to your lighting circuit.



This Equipment Consists of

8 assorted shapes, high speed steel, hand cut files, ball bearing hand piece, 9 assorted grinding wheels, 3 wheel spindles for same, 3x1 rubber polishing drum, three speed countershaft, flexible shaft 5 ft. long, ¼ HP. motor, mounted on adjustable swivel stand, wrenches, cord, switch and plug.

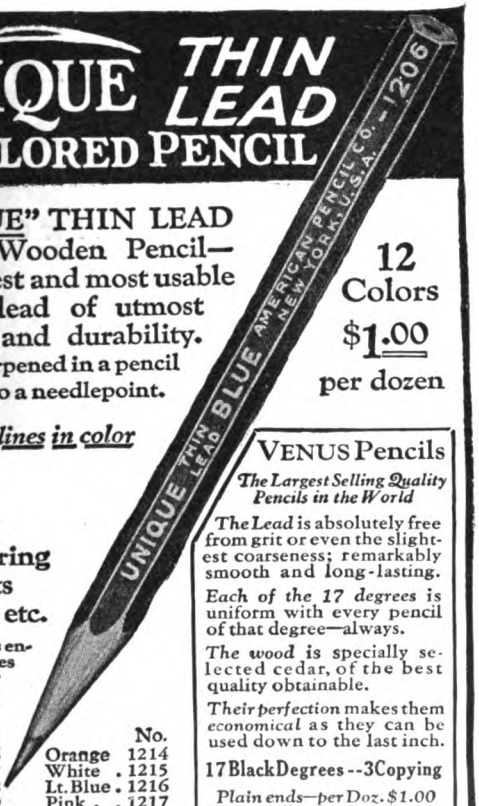
We Build Machines from 1/10 HP. to 2 HP. Send for Catalog

Manufactured by

N. A. STRAND & CO.

5001 No. Lincoln St. Chicago

UNIQUE THIN LEAD COLORED PENCIL



"UNIQUE" THIN LEAD Colored Wooden Pencil—has the best and most usable *thinnest* lead of utmost strength and durability. Can be sharpened in a pencil sharpener to a needlepoint.

12 Colors
$1.00
per dozen

Make fine lines in color for

figuring
checking
underscoring
blueprints
charting, etc.

The 12 colors enable executives to have their own symbol.

	No.		No.
Blue	1206	Orange	1214
Red	1207	White	1215
Green	1208	Lt. Blue	1216
Yellow	1209	Pink	1217
Purple	1210	Lt. Green	1218
Brown	1212	Maroon	1219

VENUS Pencils

The Largest Selling Quality Pencils in the World

The Lead is absolutely free from grit or even the slightest coarseness; remarkably smooth and long-lasting.

Each of the 17 degrees is uniform with every pencil of that degree—always.

The wood is specially selected cedar, of the best quality obtainable.

Their perfection makes them *economical* as they can be used down to the last inch.

17 Black Degrees—3 Copying

Plain ends—per Doz. $1.00
Rubber " —per Doz. $1.20

At all dealers, or write direct

AMERICAN LEAD PENCIL CO., 224 Fifth Ave., New York

Sample of UNIQUE (any color) and VENUS (any degree) sent on request

Where to Look for the Wanted Output

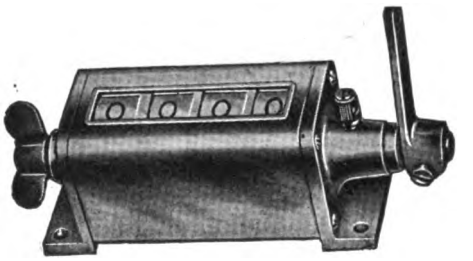
MANY managers want new machines to show an estimated annual saving of at least fifty percent. of the purchase price.

To save *that* on production-cost, any machine needs watchful tending—with its output constantly checked against its standard rate.

The watchful tending and constant check-up show the results you *want* on a

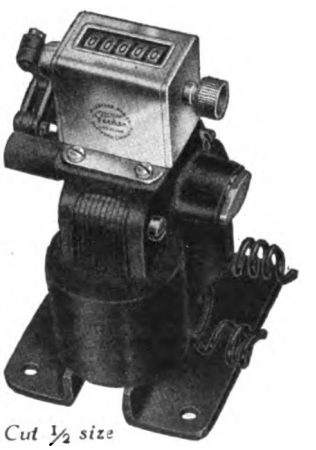
Veeder

The *Revolution Set-Back Counter* below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, $10.00—subject to discount. Large set-Back *Rotary Ratchet Counter* to count *reciprocating* movements where these count the product, $11.50 (list). Cut ½ size.

This "Form UM" Magnetic Counter counts operations or units of output from any distance that wires connect with machines.



Cut ½ size

Installed in your office, it indicates work being done by the man and machine out in the factory.

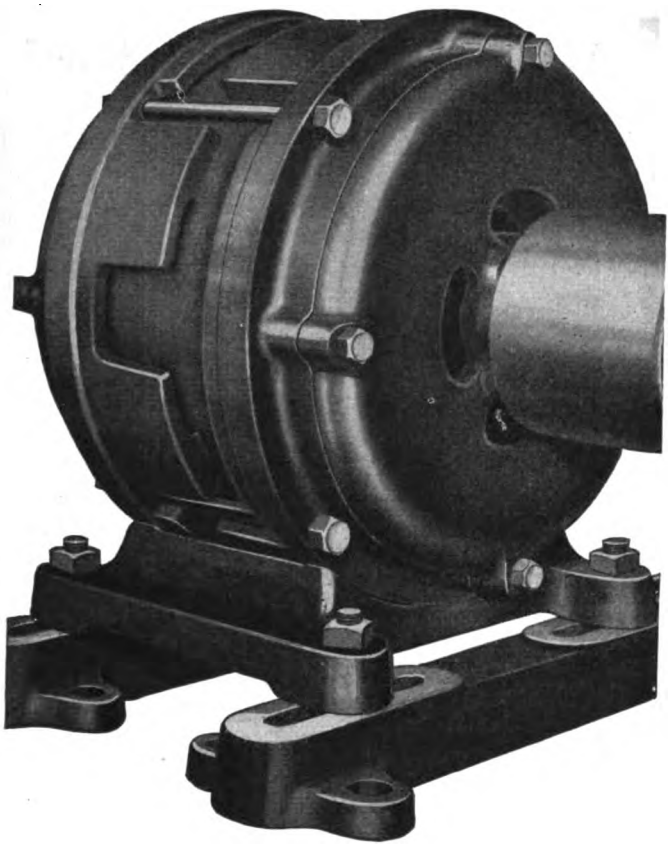
Mechanical contacts on your machine make and break the electrical circuit which operates the counter. The electro-magnetic drive can get its current from your regular lighting circuit (direct current, 110 volts), or from storage battery.

Write for the full-line Veeder booklet of mechanical and magnetic counters for all machines.

The Veeder Mfg. Co.

31 Sargeant Street, Hartford, Conn.

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Don't pet them— Forget them!

VALLEY MOTORS don't have to be petted and coddled like a nervous child or a tempermental grand opera star. The hardened steel ball bearings require little or no attention. Many users clean and oil the bearings only once a year.

The rest of the time Valley Motors just keep right on working—proving to their owners that they cost less to operate . . and do more.

Polyphase ¼ to 40 h. p., and Single Phase ¼ to 3 h. p. Write for descriptive bulletin.

VALLEY ELECTRIC CO., ST. LOUIS, MO.

District Offices: Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco

Valley

TENTACULAR TRANSMISSION BELT

THE LATEST AND MOST DECIDED IMPROVEMENT IN POWER TRANSMISSION

Ideal for short centers and high pulley ratios.

Idlers eliminated. No special pulleys required.

It pulls like a chain. Still it is a belt.

Patented all over the world

Made only by

ALEXANDER BROTHERS, Inc.

Manufacturers of Leather Belting Since 1867

18 South Street, Philadelphia, Pa.

The Finest Wrenches Made!

Armstrong Vanadium *Super-Quality* Wrenches



Extra Thin
Extra Long
Extra Light
Extra Strong

Drop-forged from chrome-vanadium steel, specially heat-treated and finished in nickel over copper, with heads buffed bright. Warranted not to break nor spread.

Here's a wrench that every mechanic will want on sight. The thin, narrow, powerful jaws make it easy to pull up nuts in unhandy places. Gives longest possible service under the toughest wear. Write for descriptive folder showing sizes and prices.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

318 N. Francisco Avenue

CHICAGO, U. S. A.

t advertised in this issue write Industry Illustrated

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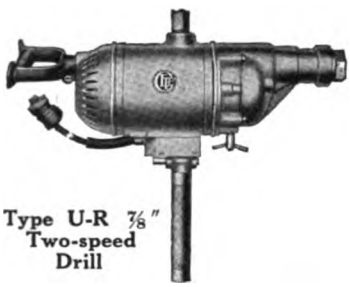
The Cincinnati

Two—Speed 7/8" Drill

DRILLS—GRINDERS—BUFFERS

Again—Another Triumph in Drilling Efficiency

Our 7/8" single speed drill made a big hit—everybody knows that . . . .



Type U-R 7/8" Two-speed Drill

Now Comes—

The Cincinnati

which you've been wanting. A second set of gearing provides for the higher speeds proper for smaller diameter drills. Change in speed is made by a single shift of the lever, while tool is running.

THE EFFICIENT ALL-PURPOSE DRILL!

Get full particulars from your jobber's salesman

THE CINCINNATI ELECTRICAL TOOL COMPANY

2685 Madison Road Cincinnati, Ohio.

Parks shipping room saw *at a lower price!*

was $75.00
NOW $60.00
without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

The Parks Woodworking Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

FILL OUT AND MAIL THIS COUPON—NOW!

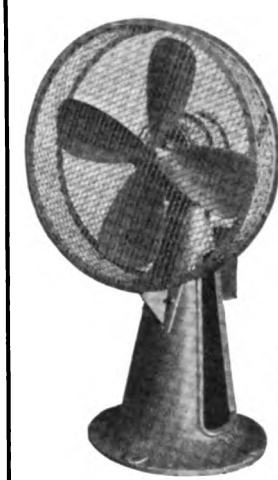
The Parks Wood-working Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.

Gentlemen: You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.

Name .....

Firm .....

Address ..... State .....



Cast Aluminum Wheels on

ROBINSON

Man Cooling

FANS

There is as much difference between ROBINSON MAN COOLING FANS and other makes as there is between one machine and another of the same type.

ROBINSON FANS are equipped with cast aluminum wheels which give

20% *More Air at Same Speed With Less Power*

These aluminum wheels require less power than any other propeller type wheel on the market. You will appreciate this if you believe in the utmost in fan efficiency at the lowest cost.

Write for descriptive literature and list of users

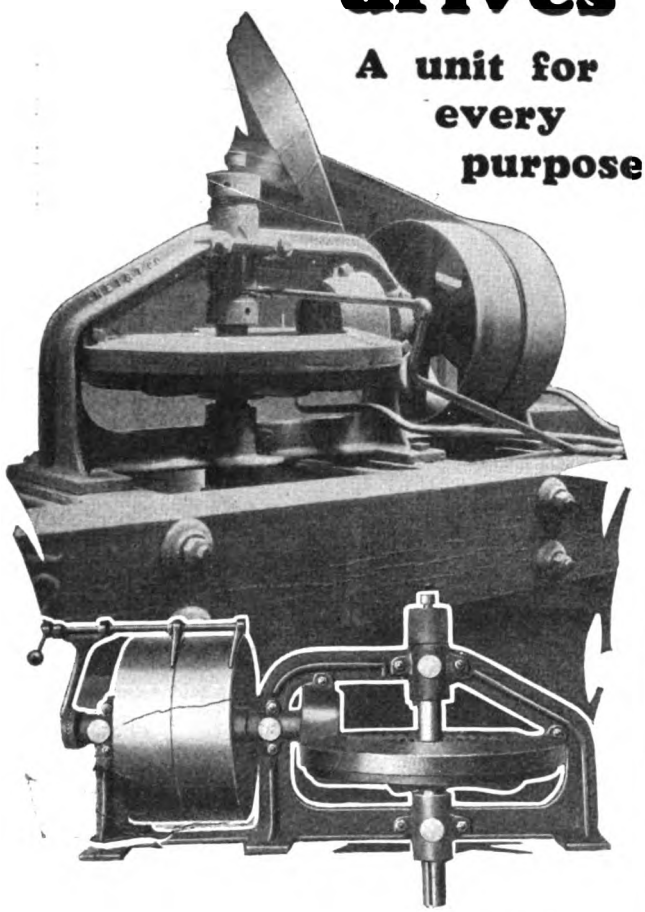
ROBINSON VENTILATING CO.
Zelienople, Pa.

ROBINSON
TURBINE & CONIFLO FANS

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standard agitator drives

A unit for every purpose



There's economy in using "New England" and "Nett-Co." standard drive units — the only practical way to solve problems in agitation.

Send for complete Specification Portfolio

NEW ENGLAND (enclosed) & NETT-CO. (open)

Agitator Drives

NEW ENGLAND TANK & TOWER CO.

EVERETT, MASS.

30 Church S... ...ew York

Chance alone governed his success



IN his capacity as tribal doctor, magician, prophet and priest, the Indian Medicine Man was thought to be endowed with mysterious powers. Often he invoked the aid of the supernatural for the accomplishment of his diverse purposes.

The spirits, however, seldom responded to his incantations and elaborate ceremonies. Chance alone governed his success.

Chance plays no part in the achievements of the Oakite Service Man in solving today's industrial cleaning problems. He works in a practical way. Guided by knowledge acquired through years of experience, he studies each problem *thoroughly*. Then applies materials and methods exactly fitted for producing the most effective cleaning possible.

In placing cleaning on this pre-determined scientific basis, Oakite Service Men have brought far-reaching economies to over 18,000 concerns in nearly 300 different industries. Let us show you, without obligation, how similar savings can be effected in your plant. A post card will do.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Oakite is manufactured only by
OAKITE PRODUCTS, INC., 40A Thames St., New York, N.Y.
(*Formerly OAKITE CHEMICAL CO.*)

OAKITE

Industrial Cleaning Materials and Methods

Slack Belts Prevent 3 Costly Belt Evil



Depending of course upon the number belts used in a plant, savings of many dolla a year are being regularly made by runnin belts slack (instead of tight), after treatme with Cling-Surface. Slippage is reduced natural creep, bearing troubles from strain tight belts eliminated, and the life of bel greatly prolonged because of new flexibili and preservation.

A special survey by engineers in a N England mill (name on request), where ov 500 belts had been treated with Cling-Surfa uncovered an average saving of $25.70 p year per belt—this does not take into co sideration power savings, which could not accurately checked.

Prove Cling-Surface benefits and economi to your own satisfaction with a 60-day proval test—or do not pay us one cent. us send trial quantity at $3.50 per gal.; gals. at $3.40 per gal.; 6 gals. at $3.25 gal. State whether conditions are warm, dusty, or reverse. Cling-Surface Co., 10 Niagara St., Buffalo, N. Y.

Openings for good salesmen

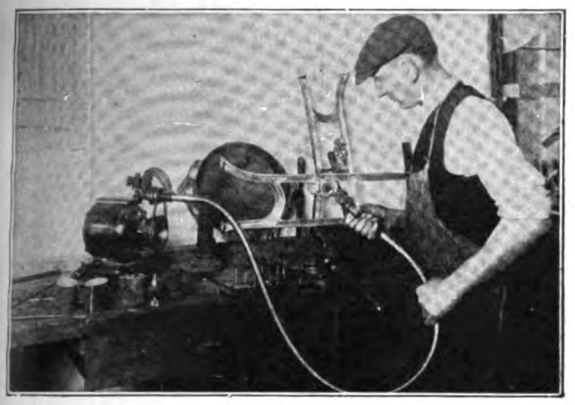
Cling~Surfac

SCIENTIFIC BELT TREATMENT

KNOW FOR YEA

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Save These For Work a Machine Can't Do



Scraping With a Rotary File Using HP-45 Equipment

As Flexible As Your Wrist

Flexibility is an outstanding advantage of Haskins Equipments. The tool can be held in any conceivable position, the operator can work with speed and better work results.

Every metal working industry can make many savings by using Haskins Flexible Shaft Equipments for Casting Grinding, Metal Pattern Making, Die Grinding, Filing, Scraping, Wire Brushing, Buffing, Polishing, etc.

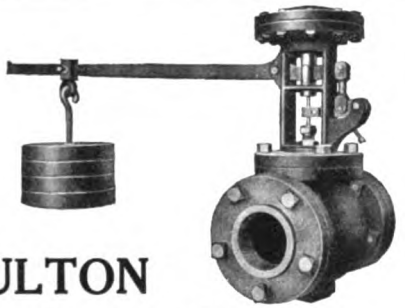
Visit Booth 256B at the National Steel and Machine Tool Exposition, Detroit, Sept. 19th to 23rd.

R. G. HASKINS CO.

Portable Flexible Shaft Machinery

4640 Fulton Street Chicago, Illinois

Branch offices in Principal Cities



The FULTON Gas-Fuel Boiler Governor

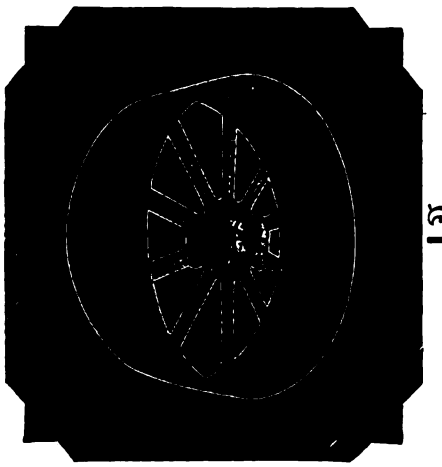
Designed for steam boilers using gas for fuel. It automatically feeds the gas to the boiler furnace in such quantity as to maintain a constant given steam pressure under varying conditions of load. Hence there is no danger of over pressure of steam; nor does the steam ever fall *below* the working pressure.

It will maintain any given pressure desired, from one pound to 150 pounds or more, without attention from the engineer, no matter how frequently or how greatly the demands for steam may vary.

Write for our catalogue

The Chaplin-Fulton Mfg. Co.

28-36 Penn Ave. Pittsburgh, Pa.



MEDART *Steel Rim* Pulleys

The first steel-plate-face pulley ever built was trade-marked "Medart." Today, including cones and drums, Medart Steel-rim Pulleys are furnished in sizes up to 16-ft. diameter by 50-in. face.

The Medart line includes everything required in the mechanical transmission of power. Speaking of pulleys alone:—The Medart family includes five distinctly different types—a 100% pulley service. Shipments prompt.

Get Medart Catalog No. 43 and discount sheet—for Everything in Line Shafting Equipment and Bulletin on Timken-Equipped Line of Industrial Applications.

THE MEDART COMPANY

(Formerly Medart Patent Pulley Co.)

General Offices and Works, St. Louis, U. S. A.

Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle

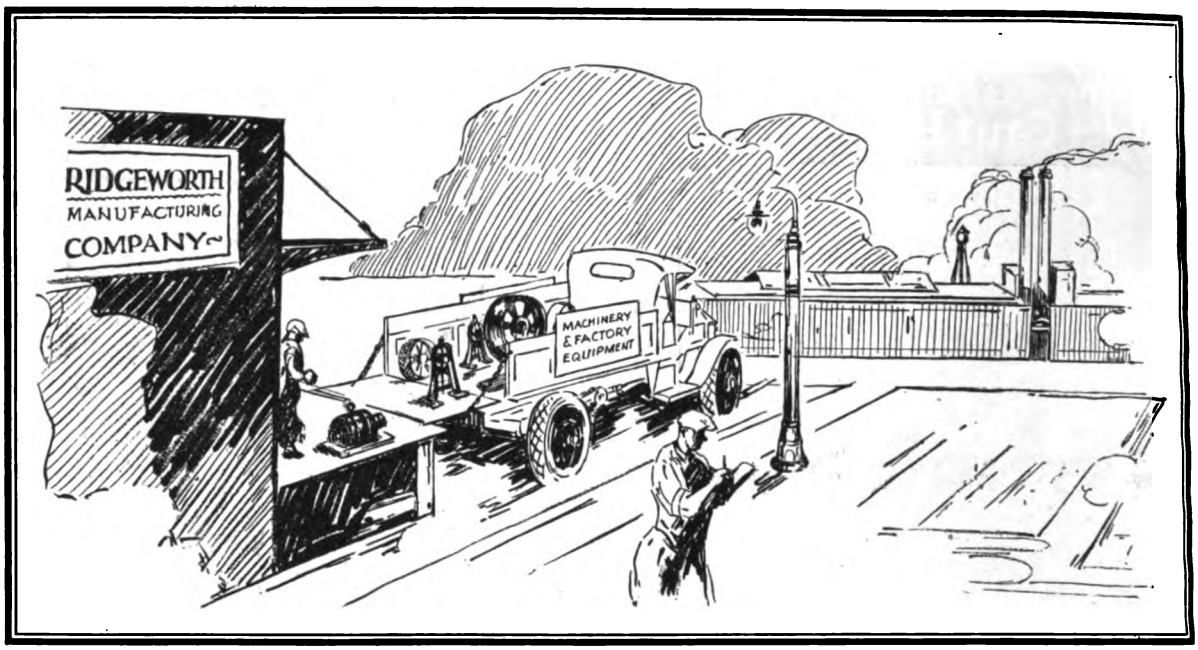
Office and Warehouse in Cincinnati

Manufacturers of Power Transmitting and Kindred Machinery

MEDART

Everything in Line Shafting Equipment

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For Nationally Advertised Industrial Equipment

Go to Your Mill Supply Distributor

HAVE you thoroughly investigated the lines handled by the machinery and mill supply distributor?

You will find that he represents a number of well known manufacturers whose machinery, equipment and supplies have built a reputation for reliability in every industry. In turn the mill supply distributor has been chosen by these various manufacturers because he has convinced them that he is in a position to give better service in your locality than can the manufacturer direct.

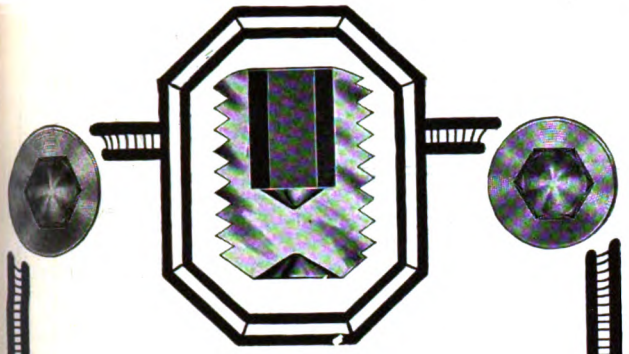
Thus the mill supply distributor not only gives you quicker and better service, but he can be relied upon for quality at all times.

Buy from the Machinery and Mill Supply Distributor

One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor

For catalogs of machinery advertised in this issue write Industry Illustrated

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Assembling

Comes to assembling: What a small cost for set screws, compared to the cost of machinist's time setting up the screws!

If he has to pet them into place, that brand's an expensive pet. If he has to dig out a broken screw it's an indirect dig at the payroll.

All good hollow screws save time. Save accidents and interruptions. In *machinist's* time an extra saving on cold-drawn "ALLENS."

30% *Extra Strength* for quick, tight set-ups; no let-ups in the assembling work or assembled job.

Fast Service from Local Stocks

The Allen Mfg. Co.

127 Sheldon St., Hartford, Conn.

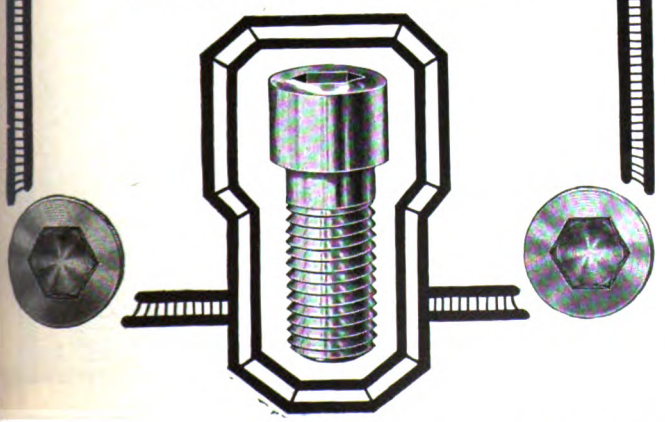
Branch Offices:

W. C. Stauble
2909 Waverly St.
Detroit, Mich.

E. P. Crawford
3348 No. Park Ave.
Philadelphia, Pa.

R. E. Gregory
1029 Wesley Ave.
Evanston, Ill.

W. J. McRae
320 Market Street
San Francisco, Cal.



THE GENUINE MORSE DRILLS ENCIRCLE THE GLOBE

Choose Your Small Tools As You Would Your Heavier Equipment



Thousands of dollars are spent for the heavy equipment. It is chosen with a great deal of care. Every factor is considered.

But, the heavier equipment can only perform efficiently if the smaller tools like drills, taps, etc., are of the same high quality. So, why not choose your small tools just as you do your heavier machines?

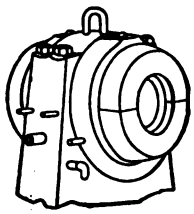
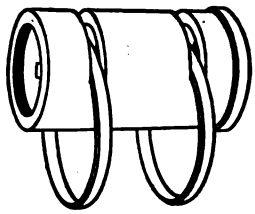
MORSE Drills, Reamers, Cutters, Taps and Dies are the result of over half a century of experience and they show the results of this experience in their performance. They are real quality tools.

From shank to tip they give 100% service.

MORSE

TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.

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"Not a hot box in six years"

A LARGE user of Magnolia Anti-friction Metal write us as follows: "We have for six years put Magnolia Metal to the severest tests in our plant on some machines running at high speed and others doing heavy work and have found it much superior in every respect to any other metal on the market. We have not had a hot box in all this time. We highly recommend Magnolia Metal."

Here is the experience of a plant in which bearing metal service is particularly severe due to the dusty atmosphere and the utter impossibility of keeping the bearings free from dirt and grit. And yet they have not had a single case of bearing trouble in all the years they have been using Magnolia.

You, too, can have dependably trouble-free bearing service by standardizing on Magnolia Metal. Pick out your most troublesome bearing, line it with Magnolia, and watch the results.



This handy bearing information book

FREE

if you return the coupon

96 pages of practical data, suggestions and instructions. Shows how to select bearing metals, how to melt, pour and finish linings. A valuable reference book based on 41 years of experience.

MAGNOLIA ANTI-FRICTION METAL

TRADE MARK

Order Magnolia Metal from your local dealer or write us direct.

In the metal line specify Magnolia Products

THE MAGNOLIA METAL CO., 75 West St., New York

Please send me the free Magnolia Bearing Book.

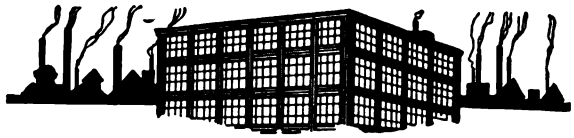
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Windows Stay Clean Longer When Cleaned with Sunburst Paste



SUNBURST PASTE cleans windows *cleaner* —they look newer, have a higher luster. They stay clean longer—you save window cleaning expense. Sunburst is as economical as it is effective—costs less than one cent per sq. ft. of pane. Safe too—contains no acid to harm workman, or water to damage machines or goods. It's guaranteed to clean the dirtiest windows like new or we will cancel your invoice in full. Send a trial order for a barrel, ½ or ¼ barrel. Five pounds will clean 500 to 800 sq. ft. of pane.

no acid to injure workman or damage machines or tools

no water to splash on valuable merchandise

SUNBURST WINDOW CLEANING PASTE

LIQUID WINDOW CLEANERS

We are also big producers of very efficient Liquid Window Cleaners. Thesco Organic Cleaner, Soft-as-Silk Liquid Soap, Hexatercide Insect Killer and Hykotar Disinfectant are among our other products for Industrial Sanitation.

THE GERSON STEWART CORP.

3541 E. 76th St. Cleveland, Ohio

THE LARGER PATTERNS OF THE

LOWELL

THE GENERAL PURPOSE WRENCH

In wide use by the

Contractor, Mining, Oil and Railroad Industries

Steel Socket Bridge Wrenches



No.	Length of Handle feet	Apprx. Weight pounds	For Nuts Short Diameter Square or Hexagon
1	2	10	1, 1 1/16, 1 1/4, 1 7/16,
1 1/2	3	12	1 5/8, 1 13/16, 2
2	3	23	2, 2 1/16, 2 3/8, 2 9/16,
2 1/2	4	26	2 3/4, 2 15/16, 3 1/8
3	3	50	3 1/8, 3 1/2, 3 7/8,
3 1/2	4	54	4 1/4, 4 5/8, 5

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Resistance to dampness is an important factor in the life of a protective paint as corrosion does not occur except in the presence of moisture.

DIXON'S Silica-Graphite PAINT

with its pigment of flake silica-graphite possesses to an unusual degree that peculiar quality of water repellancy.

Because of this characteristic, as well as its oily nature and flake formation, Dixon's Silica-Graphite Paint is unequalled in resisting corrosion and providing protection.

The result is that Dixon's Silica-Graphite Paint, judged by its cost per-year-of-service, is far more economical than the "cheaper-per-gallon" paints.

Write for booklet and color card 61-B

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1827 *One Hundredth Anniversary* 1927

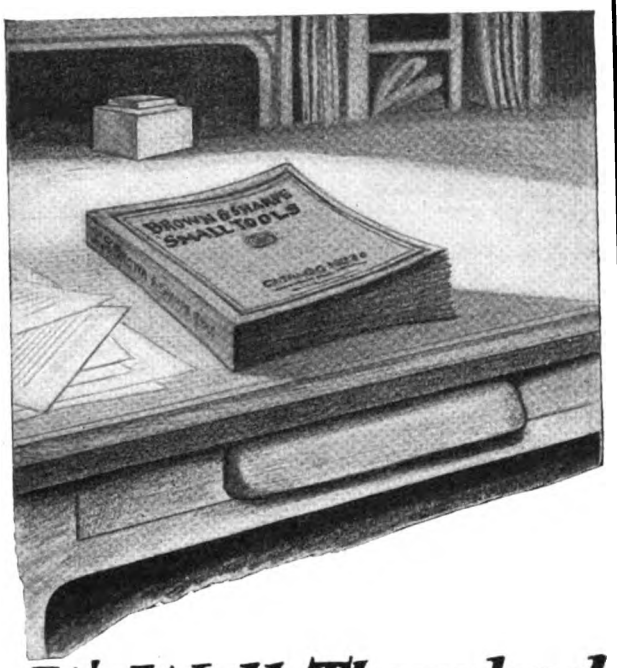


Just as the dauntless aviator pioneers his way across uncharted Seas, so have Master Engineers pioneered many refinements and improvements in motors and motor applications that concern and benefit *every* motor buyer. Write for details.

THE MASTER ELECTRIC COMPANY
Dayton, Ohio
STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio Less than 40°



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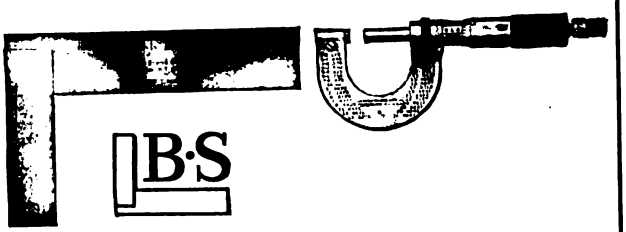
Because It Helps Lower Production Costs

You seldom find dust on Brown & Sharpe Small Tool Catalog No. 30 because it is constantly in use. But you find it well thumbed.

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There are over 2300 tools listed in Catalog No. 30—all accurately designed, reliable and unusually long lived.



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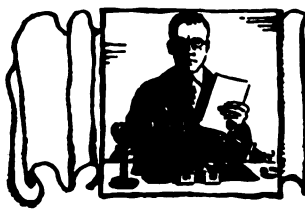
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WHERE to PURCHASE MODERN EQUIPMENT

for Mill Shop & Factory

BEARINGS

Bearings—Certified surveys that give full details of savings are to be had from the SKF Industries, Inc. See page 122.

Ball Bearings—Ball Bearings particularly suited to materials handling equipment. New Departure Manufacturing Co., page 117.

Roller Bearings—that enable trucks to give uninterrupted service under severe conditions. See page 121, Hyatt Roller Bearing Co.

Oilless Bearings—Bearings that give years of service without wearing and cut manufacturing costs are described by The Arguto Oilless Bearing Company. See page 7.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.

Lights—Where and when needed are described by The American Fixture Company. Page 132.

Portable Electric Lights—Bulletin 501-S, describing all the uses of the Reelite cable, is offered by Appleton Electric Company. Pages 118-119.

Electrical Drills—A two-speed electrical drill for smaller sized bits. The Cincinnati Electric Tool Company. Page 135.

Motors—that give a sure, steady, dependable flow of power to keep all kinds of general and special machinery in service. Diehl Mfg. Co. See page 132.

A motor so equipped with ball bearings that the life of it is greatly prolonged. Write for bulletin to Valley Electric Company. Page 134.

For Motors and motor applications that concern and benefit every motor buyer. See page 141. The Master Electric Company.

—A new motor book on Linc-Weld Motors is awaiting you at Lincoln Electric Company. Page 120.

MAINTENANCE

Paint—Booklet and color card 61-B is offered by Joseph Dixon Crucible Company. See page 141.

The Vortex Painting Method is described by The Vortex Manufacturing Company. Page 131.

Concrete floor hardeners and other paint preservatives are shown on page 147 by L. Sonneborn Sons, Inc.

Guarantee to Remain White Longest. Write for booklet "More Light." U. S. Gutta Percha Paint Company. Page 3.

Cleaning Material—Industrial Cleaning Materials and Methods are described by The Oakite Products, Inc. Page 136.

Window Cleaners—that clean safely and quickly are described by The Gerson Stewart Corp. Page 140.

Boxes—that carry your product with more safety and at minimum cost. See page 13. The Hinde & Dauch Paper Co.

Spray Equipment—Pays for itself in what it saves. Binks Spray Equipment Co. See page 132.

One spray does all your painting. 5 times faster than a brush. Saves 80% in time and costs. The Alexander Milburn Co. See page 55.

Brushes and Brooms—A long wearing bass broom of greater toughness. See page 4. The Osborn Manufacturing Company.

Unit Heaters—A heater that raises the efficiency of the worker. American Blower Co. See page 145.

—lower in cost, easy heating, flexible and inexpensive in installation cost. Buffalo Forge Co. See page 60.

Water Tanks—An elevated tank that assures fire protection. Write for booklet. Chicago Bridge & Iron Works. Page 5.

Factory Windows—Windowalls meet the unusual demand of factory lighting. Detroit Steel Products Co. Page 71.

Fans—A man cooling fan that increases production is described in circulars offered by Robinson Ventilating Company. Page 135.

MATERIALS HANDLING

Overhead Handling System—A complete line of hoists, chain blocks, trolleys, traveling cranes, and monorails. See Reading Chain & Block Corp. Page 108.

Wire Rope—of uniform construction that gives maximum protection. Williamsport Wire Rope Company. See page 64.

—a Monorail System that goes anywhere in moving material. See page 110. The American MonoRail Co.

Tractors and Trailers—Descriptive bulletins on The Trackless Train. Also describe casters. Mercury Manufacturing Co. See page 103.

Overhead Handling Systems—that speed production in America's Prominent Automotive Plants. Anchor Steel & Engineering Co. See page 106.

Lift Trucks—A lift truck that permits [illegible]ng and steering range. The Stuebing-[illegible]e 97.

Pneumatic Conveying—The modern system that recovers 99 per cent. of dust and fumes. The Dust Recovering & Conveying Company. Page 84.

Electric Cranes—Used cranes for sixty percent of the new price. N. B. Payne & Co. See page 129.

Electric Trucks and Complete Overhead Handling Systems—Everything in the line of material handling equipment is offered by the Yale & Towne Mfg. Co. See page 93-94-95-96.

Conveying Equipment—A conveyor idler that never loafs. The Brown Hoisting Machinery Co. See page 78.

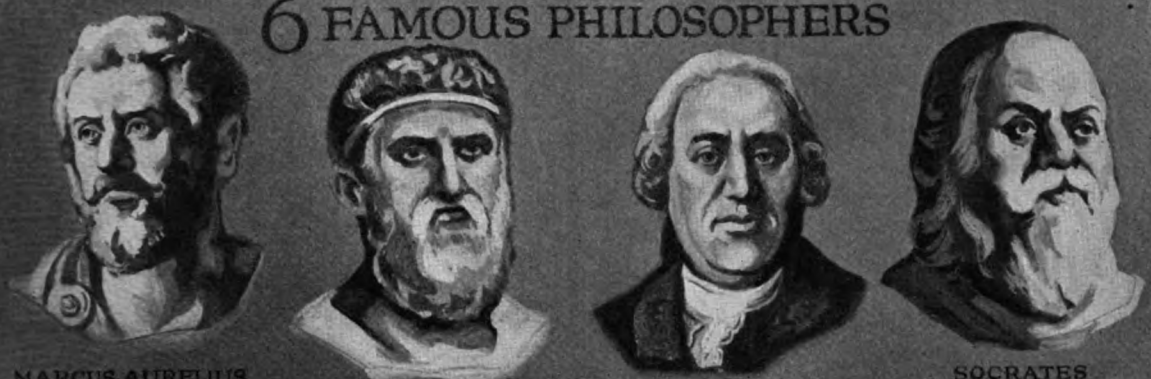
Overhead Handling Systems—A two rail overhead system that gives steadier more efficient transportation of hard to handle products. The Atlas-Chicago Co. See page 109.

(*Continued on page* 144)

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6 FAMOUS PHILOSOPHERS



MARCUS AURELIUS PLATO DAVID HUME SOCRATES



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VOLTAIRE

6 - FAMOUS TOOLS

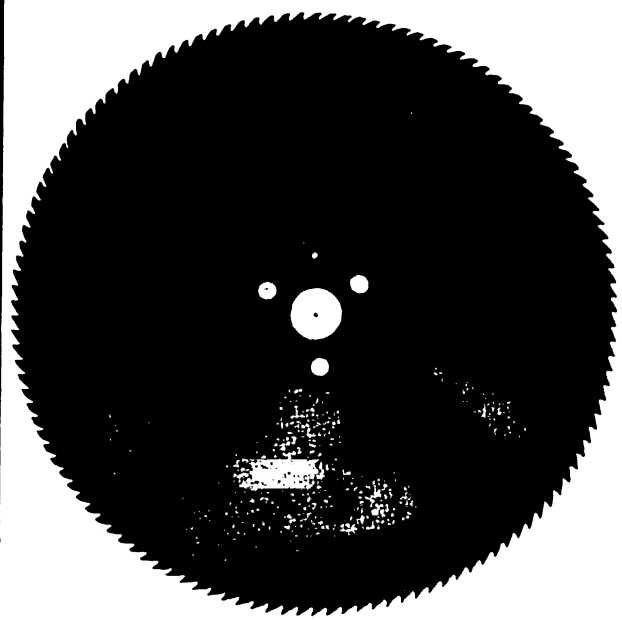


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Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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Durable under severe service and reliable on accurate work. They are made of high grade steel produced in Simonds own steel mills, scientifically tested and tempered to a degree that proves up in performance. The cutting qualities of Simonds Saws permit of extra long runs at faster feed, which means more production.

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New York City — Atlanta, Ga. — London, England — Que.

(*Continued from page* 142)

Weighing Scales—Material weighed on the go, whether handled conveyor, overhead track, power truck, etc. Toledo Scale Co. Page 126.

Pressed Steel Equipment—Handling equipment of pressed metal that reduces costs. The Powell Pressed Steel Co. See page 92.

Electric Cranes—That give exceptional service and long life. Milwaukee Electric Crane & Mfg. Corp. See page 112.

Car Unloaders—A new Jeffrey Car Unloader, X-TRACK TOR. For bulletin see page 83. The Jeffrey Manufacturing Co.

Car Movers—A car mover that saves its cost on every car moved 200 feet. See page 116. G. D. Rowell & Son.

That move heavily loaded cars are described by The Appleton Car Mover Company. See page 130.

A Car Mover that saves time in moving loaded and empty cars. The Advance Car Mover Company. See page 128.

Cranes—Typical A-c and D-c Motors, Solenoid Brakes and Control for Cranes. General Electric Company. See pages 64, 65, 124, 125.

Elevating and Conveying Machinery—that helps to reduce overhead. Page 130. Weller Mfg. Co.

Conveyer Systems—Mathews Conveyer Systems Increase Plant Profits. See page 77. Mathews Conveyer Company.

An overhead handling system that required no maintenance in eight years. See page 43. Richards-Wilcox Mfg. Co.

For eliminating handling wastes, reducing time between operations, write for "Seven Economies of Logan Conveyors." Logan Company. See page 1.

Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company. See page 128.

Conveyor Wheels—for overhead endless chain conveyors. Over 600,000 now in satisfactory use. See page 114. Saginaw Stamping & Tool Co.

Pressed Steel Equipment—A complete line of pressed steel material handling equipment is described by The Powell Pressed Steel Company. See page 92.

Trucks—built stronger to last longer. Globe Vise & Truck Co. See page 91.

—Ten styles illustrated in catalog by The American Pulley Company. See page 105.

Tier-Lift Trucks—to cover every conceivable industrial need. Write for booklet 35-A. The Lakewood Engineering Company. See page 127.

Electric Tier Trucks—A complete line of new one and two-ton tier trucks. See page 99. The Elwell Parker Electric Company.

Lift Trucks—A four-wheel lift truck with knuckled steering wheels. See page 127. Plimpton Lift Truck Corp.

Casters—Most any floor is a boulevard for Bassick Casters. Send for Catalog F-104. The Bassick Company. See page 102.

—A special duty, all-steel triple ball race truck caster. Bond Foundry Machine Co. See page 98.

Hoists—that move smoothly and rapidly. For information write Curtis Pneumatic Machinery Company. See page 111.

Sprague Hoists save time and labor in lifting and lowering loads. See page 113. Sprague Electric Hoists Division of Shepard Electric Crane and Hoist Co.

With steel plate suspension. Roeper Crane & Hoist Works, Inc. See page 128.

Overhead Hoists—Hand hoists, trolleys and electric pulleys that make up a complete overhead handling system are described on page 115 by Chisholm-Moore Mfg. Co.

Electric Hoists—an electric hoist for every purpose. Shepard Electric Crane & Hoist Company. See Back Cover.

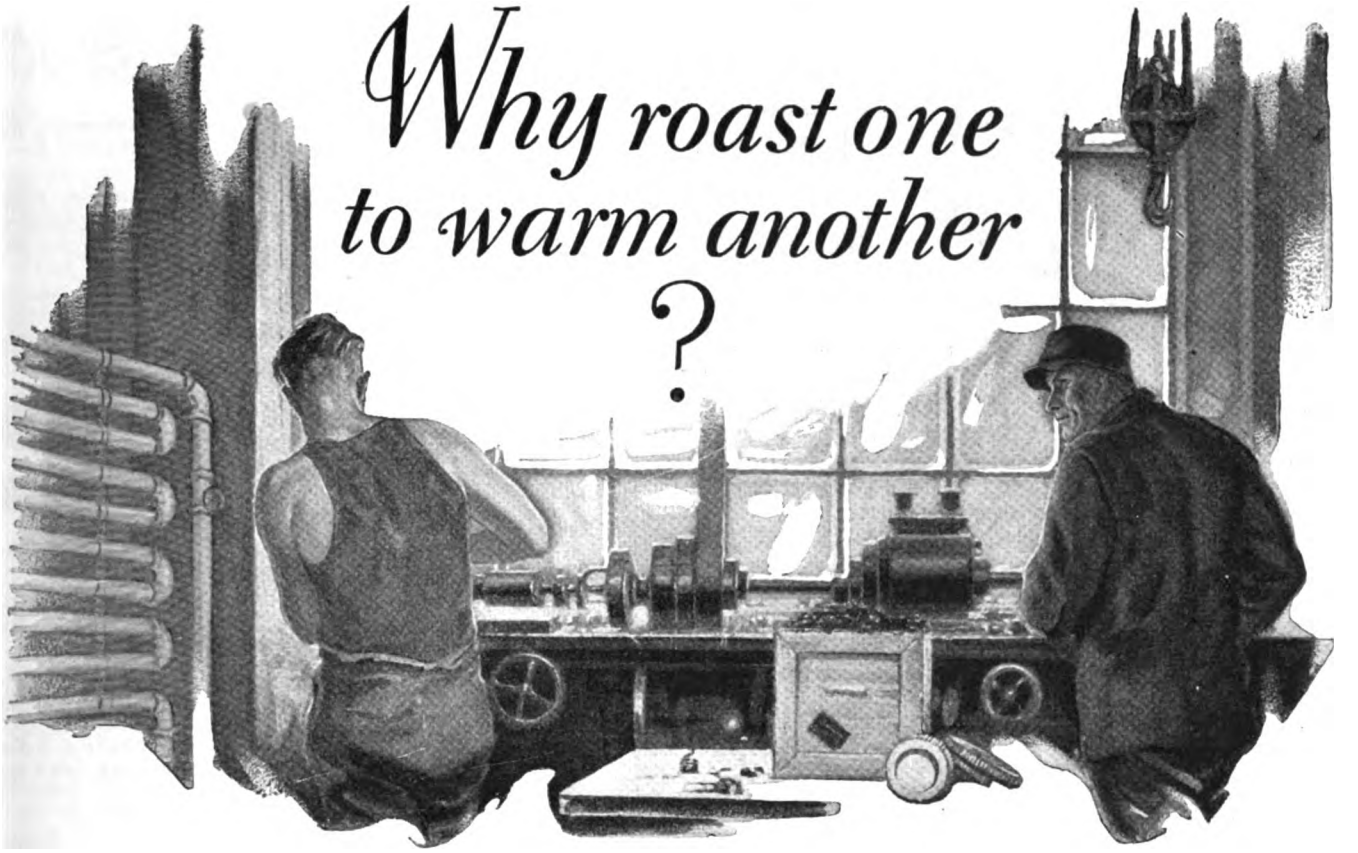
Belt Conveying Equipment—A new data book on belt con-

(*Continued on page* 146)

For product... this issue write Industry Illustrated

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Why roast one to warm another ?



Is your plant full of "hot spots" and "cold spots"?

Do you have to keep steam going full force all night to have comfortable working conditions during the day?

Are you roasting men near the heaters to warm the ones farther away?

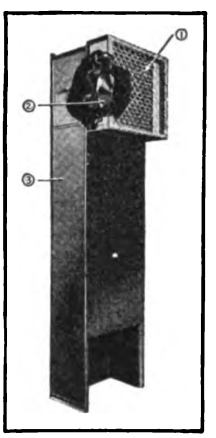
Have you certain areas that simply "can't" be heated?

If you have these conditions in your plant, Venturafin will eliminate them. It works wherever steam is available, either as a complete installation for heating an entire plant, or to supplement other methods which leave "cold spots".

Venturafin is more than five times as efficient as steam coils, radiators, etc. — has 1/10 the weight—occupies 1/4 the space—forms a complete air circuit — *forces* heat where you want it and as much as you want — and *costs less*. Over 15,000 in use.

The coupon will bring you all the facts, or ask your heating contractor.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONT.



Venturafin consists of the following major parts: (1) Copper fin-heater—with five times the radiating efficiency of ordinary iron coils. (2) The famous American Blower Ventura Blower (electrically driven) (3) Air recirculating box.

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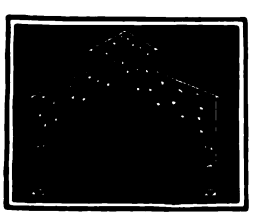
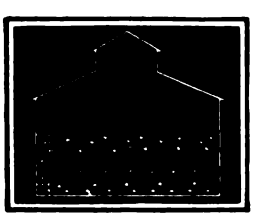


Diagram above shows how heated air rises from radiators, steam coils, etc.



This diagram shows how Venturafin Method distributes heat *evenly* in working areas.

VENTURAFIN TRADE MARK METHOD OF UNIT HEATING

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C O U P O N

AMERICAN BLOWER CO., DETROIT, MICH.

Send details relative to the application of The Venturafin Method of Unit Heating to (7)

Name_____

Address_____

City and State_____

Type and size of building to be heated_____

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1904

H E A T W I T H U N I T H E A T E R S

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Portable Electric Band Saw

This H & A Portable Electric Band Saw has saved its cost in 30 days in hundreds of busy plants.

It can be used in your pattern room where accuracy is essential, or on your production jobs where speed and convenience are important.

Sturdily built with plenty of power it will stand rigorous use in any shop. It is of convenient size and weight to move about to where it is needed.

The H & A Line of Bench Woodworking Machinery includes Band Saws, Rip Saws, Swing Saws, Scroll Saws, Wood Lathes and Jointers. Every machine is sold on a money-back guarantee.

Send us a description of your work and we will give you production figures—show you the way to greater economy. Get our free catalog of Bench Woodworking Machines.

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Portable Electric H&A Bench Machines

Operates from any Lampsocket

La Salle Grinders

For Precision and Production

No. 2 Automatic Surface Grinder

Grinds Work to
20"x6"x10" Standard
24"x6"x10" Extra
With 7" Wheel

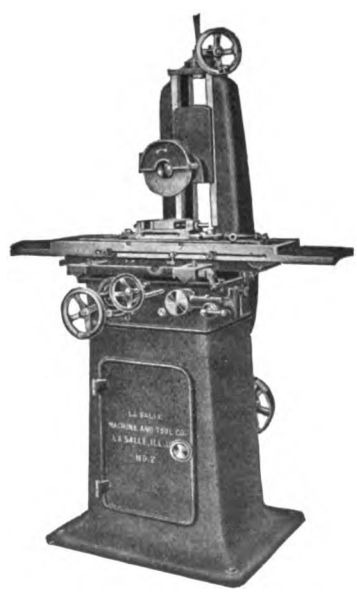


Table travels automatically in both directions. A hand - power table movement can be operated without changing automatic feed.

Also has automatic cross feed in either direction with automatic stop. Wheel truing device is built integral with machine. Price, $550. F. O. B. La Salle, Ill.

YOU WILL FIND nothing better than the La Salle No 2 Automatic for grinding dies, punches and a wide range of small tools, as well as for many manufacturing jobs. Exceptionally rigid, it has ample provision for preserving perfect alignment. Arranged for either wet or dry grinding, with belt or direct motor drive.

LA SALLE GRINDERS include our No. 1 at $115 and No. 3 Plain and Surface Grinder at $365 to $390; No. 2 Automatic Surface Grinder; and American Wet and Dry Drill Grinders in various sizes at $120 to $350—each a real leader in its class. *Write us about the capacities of these modern Grinders.*

LA SALLE TOOL COMPANY

OTTAWA, ILLINOIS, U. S. A.

La Salle County Formerly of La Salle, Illinois

(*Continued from page* 144)

veyors of practical use to all industrial executives. See pages 76, 88, 154. Link-Belt Company.

Scales—"Weigh While You Convey," described by The Merrick Scale Mfg. Co. See page 127.

Foundry Ladles—A bottom pour ladle, self skimming, that eliminates danger from explosion. See page 116, Rowell Mfg. Co.

Gasoline Locomotives—that have proven themselves by the large list of users and repeat orders. The Fate-Root Heath Co. Pages 100-101.

Overhead Monorail Systems—A new seventy-two page book on materials handling via the ceiling. See page 107. The Louden Machinery Co.

Speed Reducers—that give smoother, more efficient operation of handling equipment. See pages 86-87. R. D. Nuttall Co.

Lubrication—Lubricators that cut down the cost of operating materials handling equipment. The Bassick Mfg. Co. Page 123.

Hand Trucks—The "Little Giant," a small truck that enables one man to handle 500 lbs. See page 2 Alemite Die Casting & Mfg. Co.

POWER PLANT EQUIPMENT AND AUXILIARIES

Steam Traps—Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving maximum heat from steam used. Write for Bulletin 133. Illinois Engineering Company. Page 148.

Eliminating Waste in the steam line. Write for booklet R-284. Sarco Co., Inc. See page 151.

Gas-Fuel Boiler Governor—Designed for steam boilers using gas for fuel. The Chaplin-Fulton Mfg. Co. See page 137.

Unions—A free trial offer is made by E. M. Dart Mfg. Co. Page 151.

Heat Insulation—Packings, refractory cements and other power saving material. Johns-Manville. See page 149.

Heating Pumps—For the nearest pump engineer, Nash Engineering Company. Page 16.

Industrial Thermometers—A complete service by the Engineering Staff is offered by The Industrial Division of The Moto Meter Company, Inc. Page 153.

TOOLS (Shop Tools, Saws, Files, Chucks, etc.)

Surface Grinders—Particularly efficient on a wide variety of small tools. Full particulars may be had from the La-Salle Tool Company. Page 146.

Filing, Grinding and Polishing Machines—A new development for the finishing of dies and similar work. N. A. Strand & Company. Page 133.

Drills—The six famous twist drills are described by The Cleveland Twist Drill Company. Page 143.

For high speed drills see The Standard Tool Co. Page 9.

Morse Twist Drill & Machine Company Drills, Cutters, Taps and Dies show the result of over half a century of experience. See page 139.

Wrenches—Reversible Ratchet Type are shown by The Lowell Wrench Company. Page 140.

—a descriptive folder is offered by Armstrong Bros. Tool Co. See page 134.

—Of Chrome Vanadium Steel are described by Bonney Forge & Tool Works. Inside Front Cover.

Buffing and Polishing Machines—The first selective speed buffing and polishing machine that gives all required speeds. The U. S. Electric Tool Company. See page 72.

Set Screws—that save accidents and interruptions. The Allen Mfg. Co. See page 139.

Screw Drivers—of the highest quality special analysis steel. See page 131. American Saw & Mfg. Co.

Shovels—H. K. Wood's Mo-lyb-den-um Steel Shovel, goes five times as far and is then ready to outwear six more shovels. See page 8. The Wood Shovel & Tool Co.

(*Continued on page* 148)

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Increase the *Life and Serviceability* of Your Concrete Floors!

GRINDING use will wear down and break the surface of the best concrete floors *unless they are specially hardened.*

In selecting a hardener it is wise to consider its reputation for service. Lapidolith is the original concrete floor hardener. It was widely used for years before the "just as good" imitations appeared on the market. When you treat your floors with Lapidolith you can be certain of satisfactory results.

Not only is the reputation of this product your guarantee of lasting protection, but you have an additional safeguard in the standing of the concern behind it. Any architect or builder knows the worth of Sonneborn products.

Lapidolith can be applied by your own workmen for it goes on the floor like water. If desired, our own service crew will apply it.

This liquid, chemical compound penetrates cement pores, arresting the wear on old floors and preventing any wear on new ones. Makes floors hard for a life-time.

In your own city we can show you floors that are Lapidolith-treated so you can see for yourself how it protects and saves.

The coupon below will bring you literature and samples.

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Other Sonneborn *Life-Savers* for Buildings

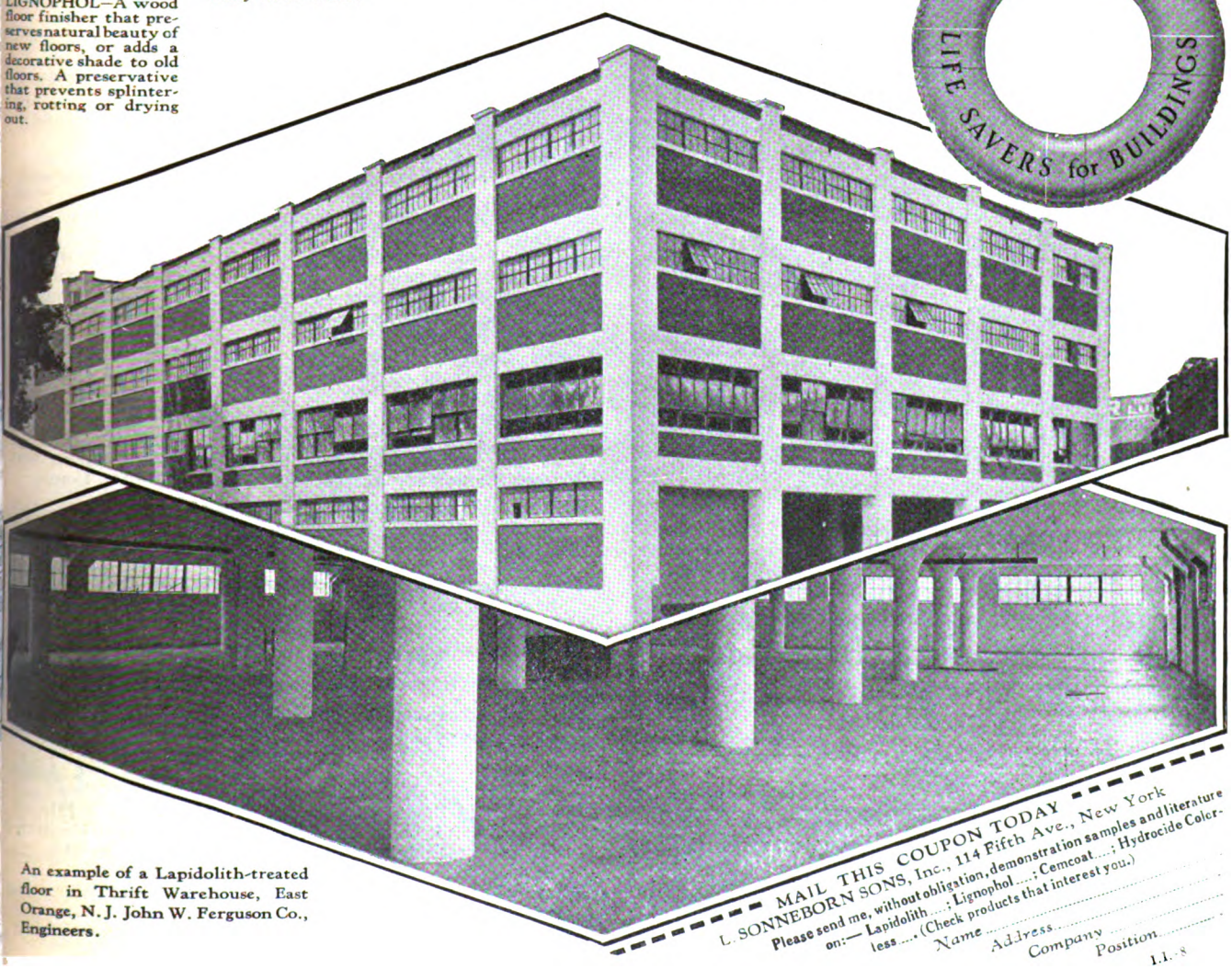
HYDROCIDE—A complete line of water and damp-proofing products for walls, copings, foundations.

LIGNOPHOL—A wood floor finisher that preserves natural beauty of new floors, or adds a decorative shade to old floors. A preservative that prevents splintering, rotting or drying out.

CEMCOAT—A white paint that stays white longer than similar paints. Can be washed over endlessly. Adheres to brick or concrete as easily as to wood.

L. SONNEBORN SONS, Inc.
114 Fifth Avenue, New York

SONNEBORN LIFE SAVERS for BUILDINGS



An example of a Lapidolith-treated floor in Thrift Warehouse, East Orange, N. J. John W. Ferguson Co., Engineers.

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L. SONNEBORN SONS, Inc., 114 Fifth Ave., New York

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When the heating system is started, air is rapidly vented through the Thermo by-pass and quick and positive steam circulation is thus obtained.

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No. 15 Drip Trap (furnished in nickel plated finish) is extensively used on Sterilizers, Steam Kettles and similar apparatus.

Write for Bulletin 133

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPORATED 1900
CHICAGO

(*Continued from page* 146)

Portable Electric Band Saw—saves its cost in 30 days. Heston & Anderson. See page 146.
Metal Cutting Saws—Durable under severe service and reliable on accurate work. Simonds Saw & Steel Company. See page 144.
Saws—Cut costs with a Parks shipping room saw. The Parks Woodworking-Machine Company. Page 135.
Shop Tools—Catalog No. 30 lists 2300 long lived, accurately designed, reliable tools. Write for it. Brown & Sharpe Mfg. Co. See page 141.
Electric Tools—Super power production electric tools that operate on high cycle A-c current. The Black & Decker Mfg. Company. See page 14.
Pipe Tongs—with double-ended, reversible jaws that double the life of the tool. J. H. Williams & Co. See page 11.
Wrenches—Super quality wrenches. Drop-forged from chrome-vanadium steel. See page 134. Armstrong Brothers Tool Co.
Woodworking Machinery—Portable Electric Band Saws that have saved their cost in 30 days. Heston & Anderson. Page 146.
Grinders—That maintain required accuracy on close limit external and internal precision grinding, on large and small work. Wisconsin Electric Company. See page 73.
Flexible Shaft Machines—A ballbearing flexible shaft machine for filing, drilling, grinding, etc. For catalog see page 131. Mall Tool Co.

TRANSMISSION EQUIPMENT
(Including Belting)

Clutches—that prolong the life and increase the working capacity of any machine. Twin Disc Clutch Company. See page 74.

The New Conway Disc Clutch and its ten salient features are shown by Conway Clutch Company. Page 8.
Belting—Pliable belts that last longer. Chas. A. Schieren Company. See Inside Back Cover.

—built to lower materials handling costs. See pages 79, 80, 81, 82. Boston Woven Hose and Rubber Co.

A transmission belt for short centers and highpulley ratios. Alexander Bros., Inc. Page 134.
Belt Treatment—Slack Belts Prevent 3 Costly Belt Evils. See page 136. Cling-Surface.
Belt Drives—Get maximum results from properly designed Belt Drives. See page 6. The Rockwood Manufacturing Co.
Pulleys—For information regarding five different types of pulleys, see page 137. The Medart Company.
Hangers—Cast iron hangers that give out-of-the-ordinary service. See page 12. T. B. Wood's Sons Company.
Flexible Shaft Equipment—Flexibility is an outstanding advantage of Haskins Equipments. R. G. Haskins Company. See page 137.
A Belt Lacer—combining the dominant features of speed-power-ease of operation. Clipper Belt Lacer Company. See page 10.
Speed Reducers—Use where continuous production counts. W. A. Jones Foundry & Mach. Co. Page 85.

A ball bearing force-feed lubricated speed reducer that has an efficiency of over 96%. Reeves Pulley Company. Page 90.

A catalog describing The Lewellen Transmission for varying speeds is offered by Lewellen Mfg. Company. Page 89.
Bearing Metals—a handy book on a bearing that has stood one for 6 years. See page 140 Magnolia Metal Co.

MISCELLANEOUS

Measuring Instruments—Instruments that carry the guarantee of seventy-odd years of manufacture are described by Taylor Instrument Companies. Page 70.
Goggles—for protecting against light fumes and smoke. Willson Goggles, Inc. See page 9.
Pressed Metal Parts—The Breese Bros. Co. Page 151.
Counters—A full line of magnetic and mechanical counters for all machines is offered by The Veeder Mfg. Co. Page 133.
Agitators—Drive units that solve agitation problems. See page 136. New England Tank & Tower Company.
Pencils—Twelve colors in thin leads for all purposes. American Lead Pencil Company. See page 133.

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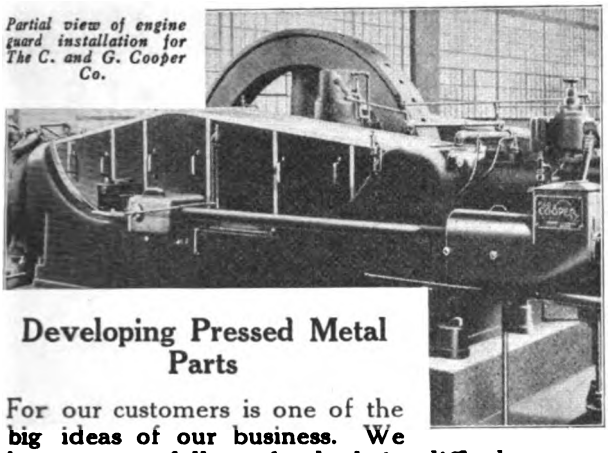
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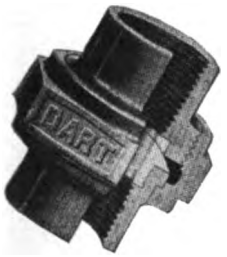
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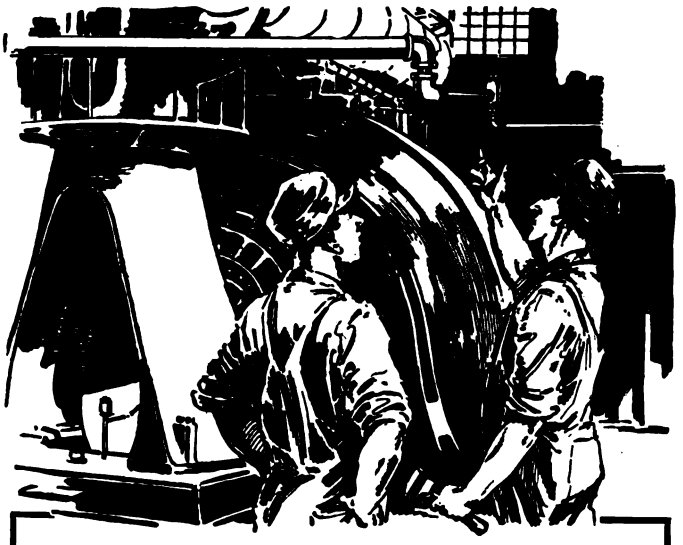
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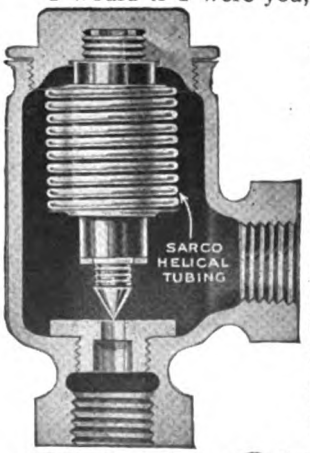
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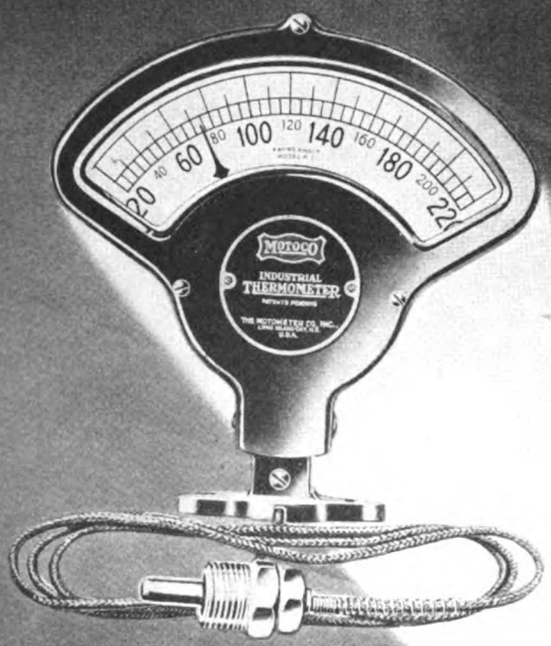
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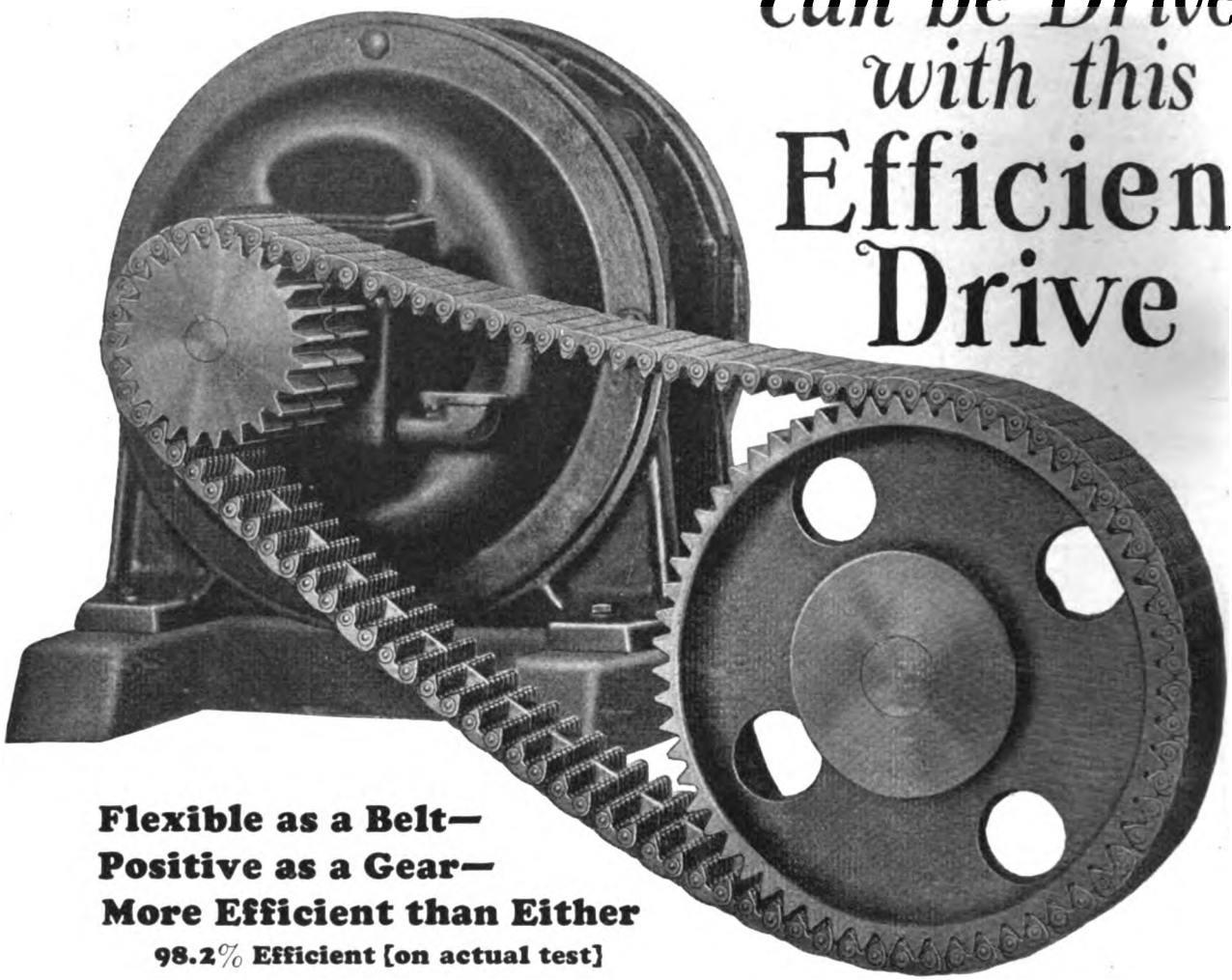
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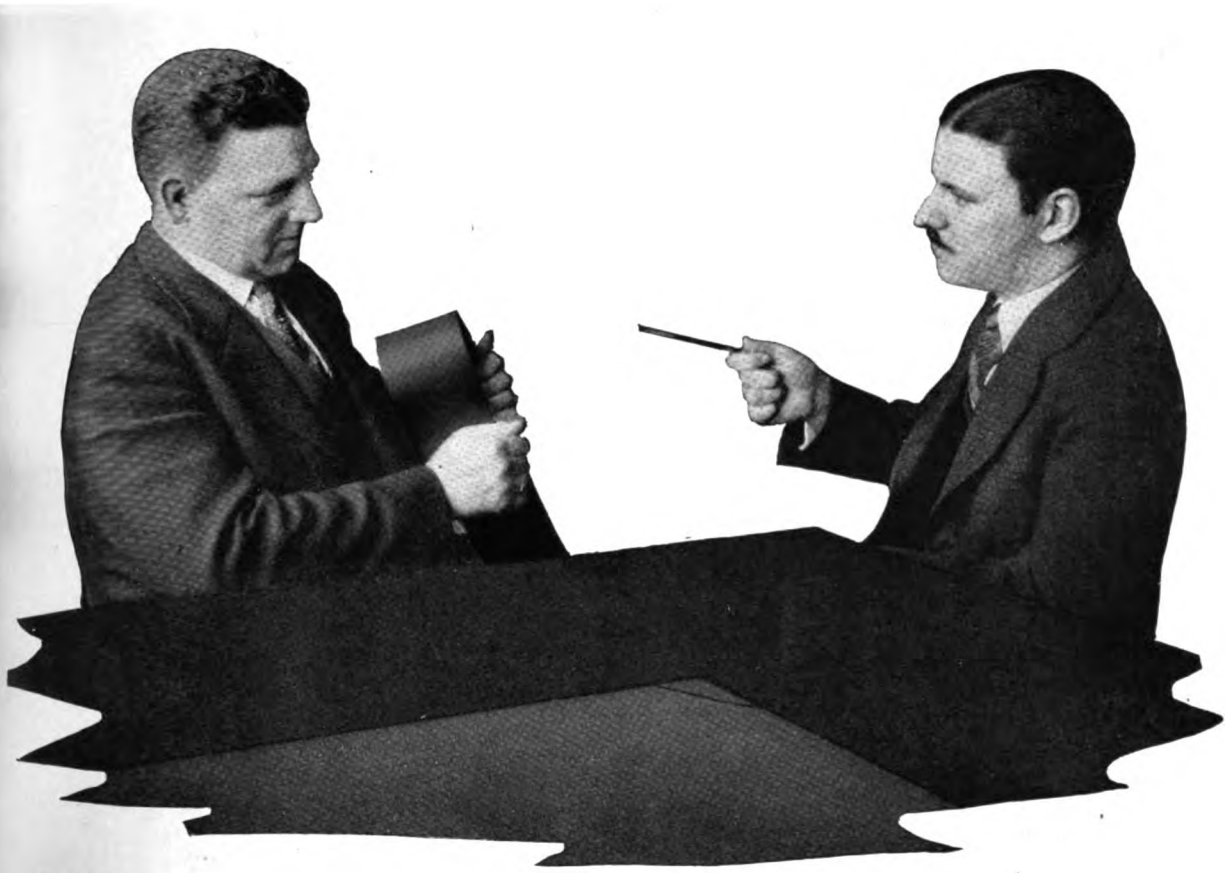
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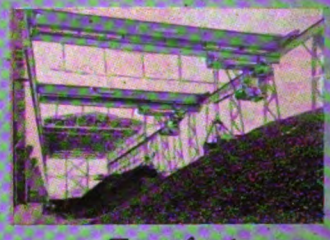
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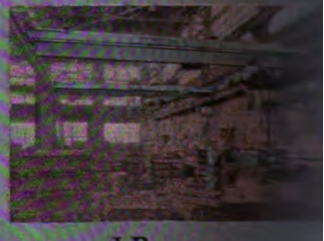
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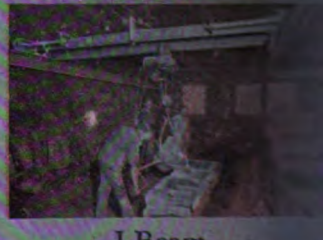
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Industry Illustrated

Modern Methods and Equipment for Mill, Shop & Factory

In This Issue

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Practical Shop Heads Buy:

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In other words: On Performance—not Price

See page 9 for convincing arguments why Cutting, Bench and Hand Tools should be bought on the same basis—Performance.

But the Performance of all tools depends upon the choice of the right tool for the job. All the articles in this issue show how to get the most out of the best tools. No user can afford to miss them



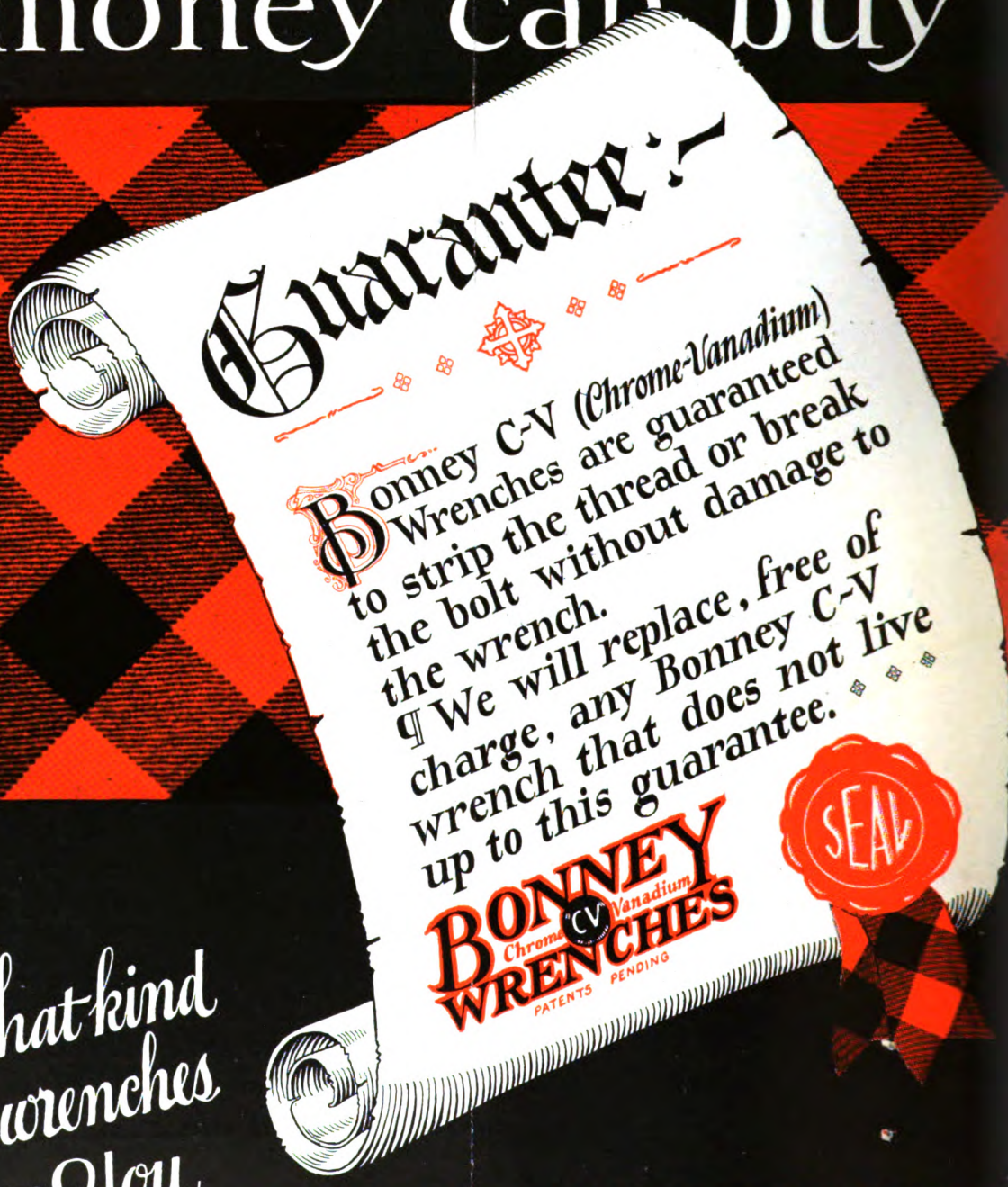
HAND › BENCH AND › MACHINE TOOL › NUMBER ›

How the Wright "Whirlwind" Motor Is Built

(See page 11)

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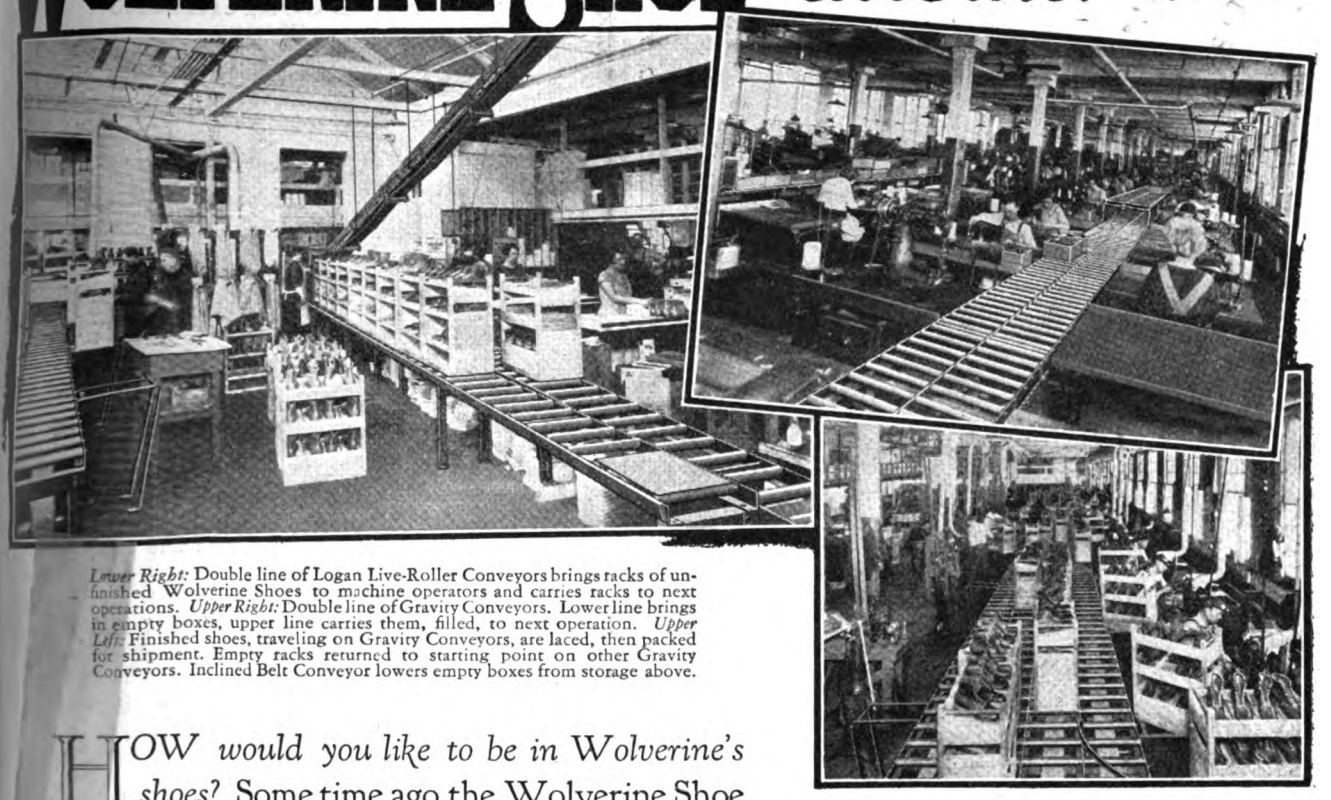
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WOLVERINE SHOE—another user



Lower Right: Double line of Logan Live-Roller Conveyors brings racks of unfinished Wolverine Shoes to machine operators and carries racks to next operations. *Upper Right:* Double line of Gravity Conveyors. Lower line brings in empty boxes, upper line carries them, filled, to next operation. *Upper Left:* Finished shoes, traveling on Gravity Conveyors, are laced, then packed for shipment. Empty racks returned to starting point on other Gravity Conveyors. Inclined Belt Conveyor lowers empty boxes from storage above.

HOW *would you like to be in Wolverine's shoes?* Some time ago the Wolverine Shoe & Tanning Corporation installed Logan Conveyors. Then here's what happened! "Our Logan Conveyors," they say, "have enabled us almost to *double* our capacity in the same space, to put our shoes through in a *quarter* of the former time *and to cut our handling cost from ten to twelve percent.*" Wolverine Shoe is not an isolated instance — Whatever you make, whatever you handle, it is quite probable that Logan Conveyors can save *you* time and labor, cut *your* manufacturing costs and materially increase *your* plant capacity. Write for a copy of "*Seven Economies of Logan Conveyors.*" It will not obligate you.

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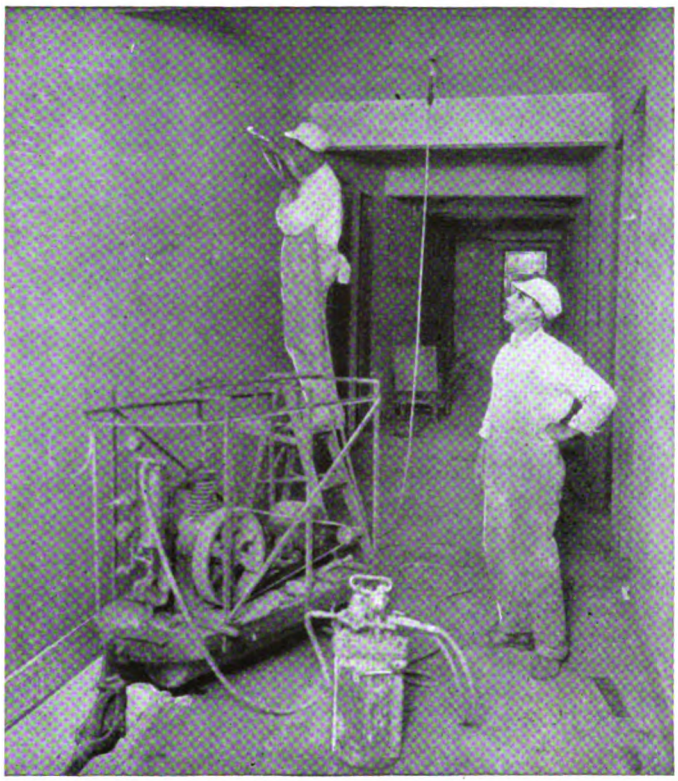
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Logan Conveyors
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Repainting can now be done more frequently. Spray-painting by the Binks method costs but a fraction of hand-painting. This machine painting method is so rapid, there's less interference with regular business routine.

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WHILE it has always been our aim to present in each issue of this magazine a table of contents of sufficient variety to cover most phases of factory activity, we have long felt that some of these phases are of such perennial interest as to call for more frequent treatment in our columns.

We have, therefore, created four Departments which will appear each month beginning with our October issue. They are:

1. **The Shop Department,** which will present the latest developments in the operation and equipment of machine and wood shops, structural and plate shops, the forge, foundry and tool-room.
2. **The Power Department,** which will deal with economy methods and apparatus for the generation, distribution and use of power.
3. **Materials Handling Department,** which will deal with ways and appliances for cost saving in the transportation of bulk and fabricated materials through the yard, buildings and shops.
4. **The Plant Maintenance Department,** which will discuss the systematic upkeep of buildings and mechanical equipment.

Each department will be conducted by a recognized authority. Other departments will be added from time to time as the interest of our readers warrants. It is our intention that they shall all contain the maximum of useful information.

Morgan G. Farrell
Editor.

Industry Illustrated

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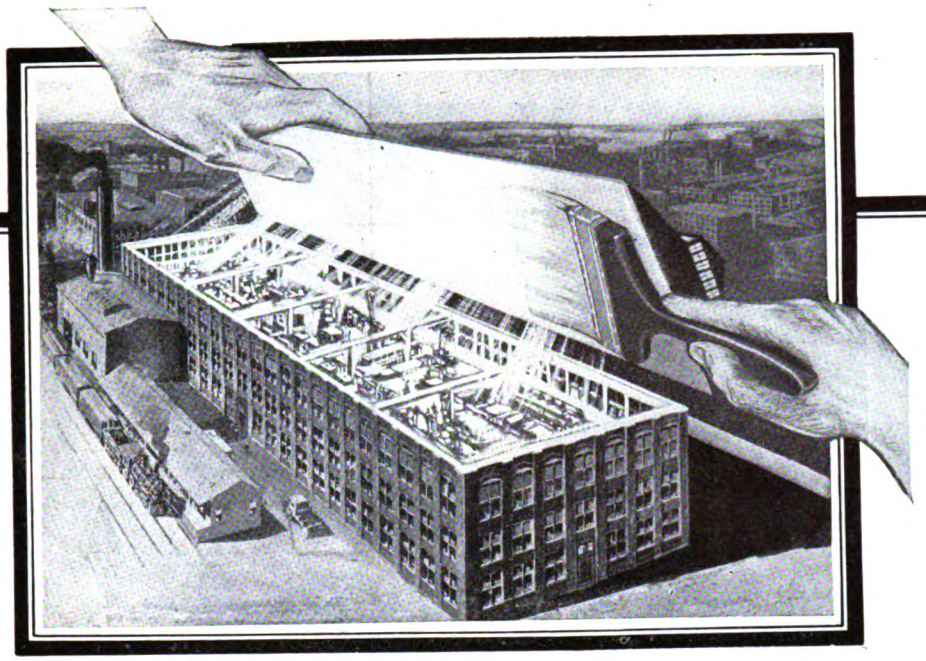
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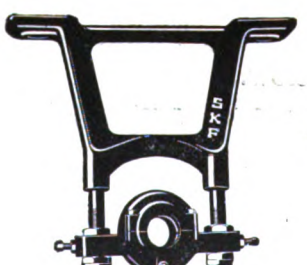
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Don't let *friction*—the power-pirate loot your plant



*A certified survey in portfolio form showing detailed savings effected by Skayef Hanger installations in seventeen representative industries will be sent on request.

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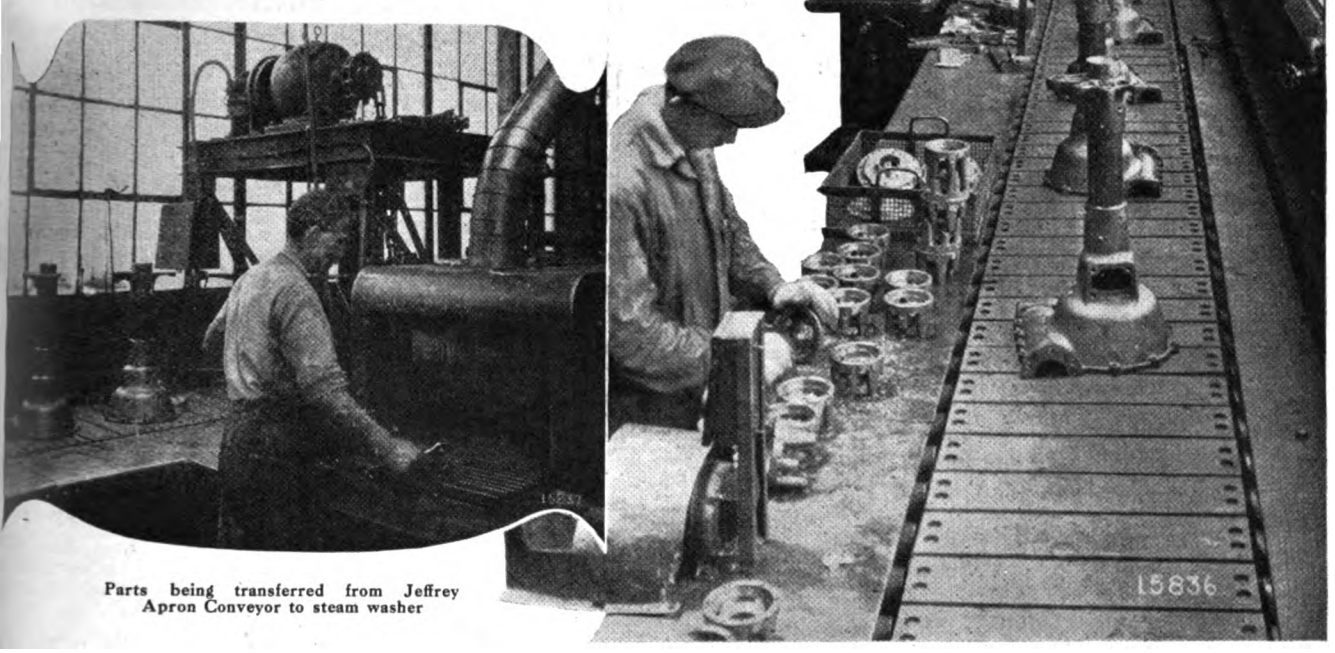
The small parts and gears are taken from the drill presses and milling machines and placed in wire tote boxes going to the steam washer and enameling bath. The larger housings rest directly on the conveyor.

This Jeffrey Apron Conyeyor is two hundred and five feet long. The maple flights are carried on two matched strands of Jeffrey 951 Steel Thimble Roller Chain.

Jeffrey Conveyors have brought straight line production to manufacturing plants in every industry.

With a continuous moving Jeffrey conveyor handling your product through several processes, work at the machines can be speeded up and congestion around them eliminated.

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Parts being transferred from Jeffrey Apron Conveyor to steam washer

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Can You Use More Information on Factory Daylighting?

THE daylighting results obtainable with any given arrangement of windows can now be predicted with considerable accuracy by a method used by the Department of Engineering Research of the Detroit Steel Products Company. By this method, practical answers can be given to important questions which might logically have your serious consideration before your building plans are complete.

For instance, in the design of a wide, one-story factory building, such problems as these are introduced:

Should the building have a monitor?

If a monitor is indicated, what should be its design?

How do different monitor widths affect even distribution of daylight?

What are the relative values of various heights of monitor windows?

What are the advantages of monitors with vertical windows? With sloping windows?

How is the daylighting affected by:

(1) A narrow monitor with vertical sides?
(2) A wide monitor with vertical sides?
(3) A narrow monitor with sloping sides?
(4) A monitor with a "dip" roof?

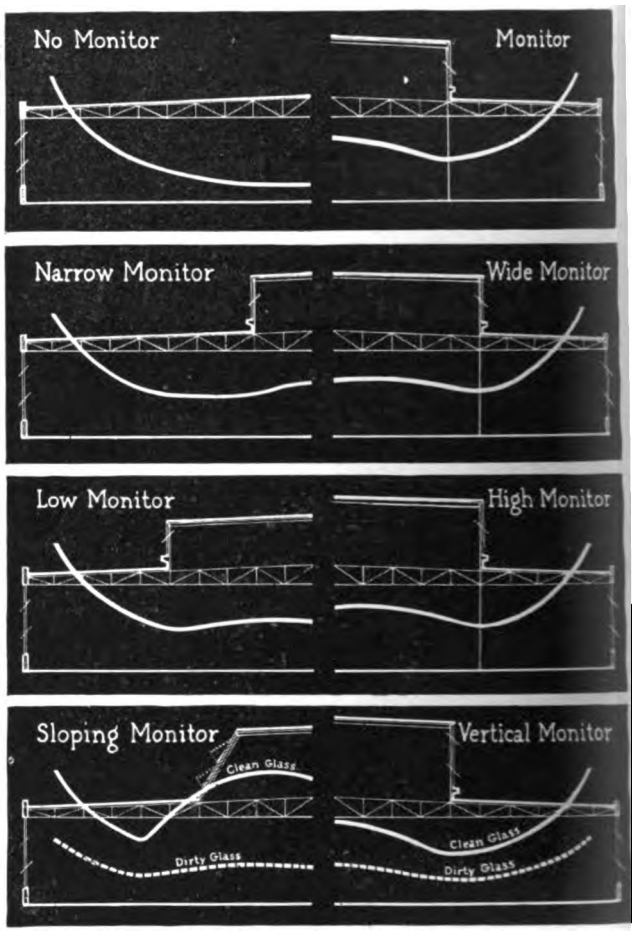
What should be the ratio between maximum and minimum daylighting?

What is the effect of six months' dirt accumulation on the daylight obtainable with:

(1) A monitor with vertical windows?
(2) A monitor with sloping windows?

For the answers to these and other questions before your building plans are completed,

How Monitor Design Affects Daylighting



Note: The heavy curves indicate light intensity through clean glass. The dotted line in the lower illustration indicates light intensity through glass with six-months' dirt accumulation.

Ask Fenestra

DETROIT STEEL PRODUCTS COMPANY ' 2242 East Grand Boulevard ' DETROIT, MICHIGAN

What can you tell me about securing even distribution and intensity of light in the building described below?

Type of building contemplated: Single Story.....
Multi-story.....To be used for the following purposes....

.....

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Length.....Width.....Height.....

Note: If possible, send tentative plans, elevations, sections or sketches showing size and location of all proposed windows with sill heights, together with any additional information which would have a bearing upon the design of the structure to be erected.

Name of Company..... *Your Name*.....

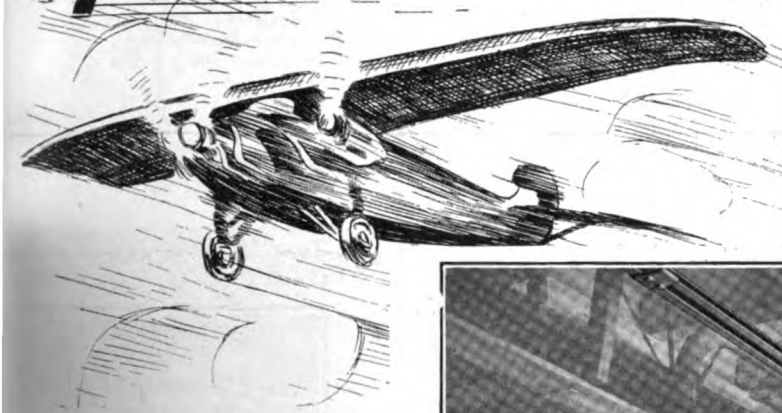
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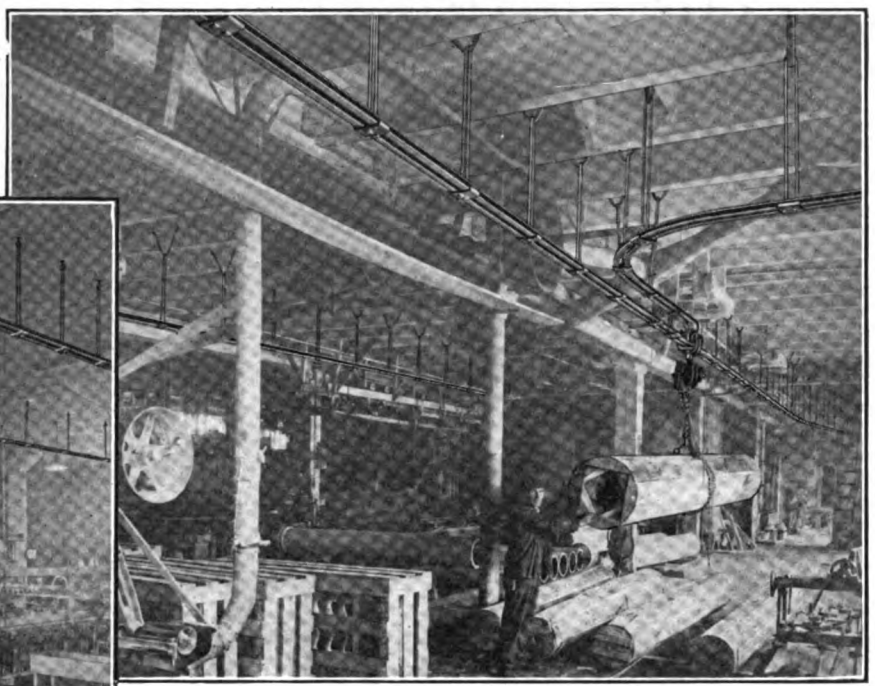
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The TWO-RAIL *Overhead Handling System*

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The TWO-RAILS instead of one as in the old method, eliminate all the jerky motions and jars which the single rail is subjected to.

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Before you make any additions of handling equipment, investigate the DUO-RAIL.

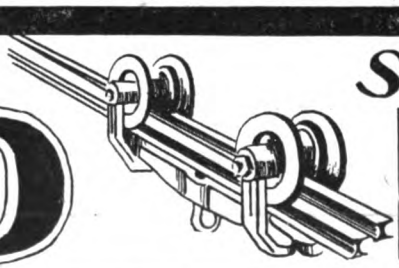
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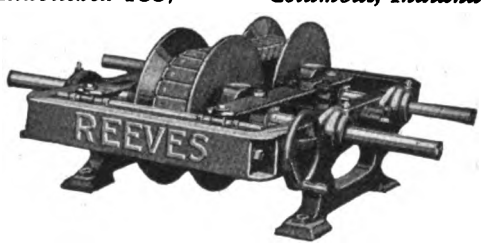
Millions of speeds between fastest and slowest—*any* speed, even to the smallest fraction of a revolution—that's what you need for *accurate* speed control. Then, you can run your machinery *always* at the *exactly proper speed* for any material change, any schedule change, or any other change in operating conditions.

The REEVES Transmission represents the *only* method by which you can get *any* speed on *any* machine at *any* time. The REEVES has no steps—it is *infinitely adjustable!* It will maintain one set speed indefinitely, or it may be changed *instantly* to *any* speed you desire. Inexpensive and easy to install. Simple to operate. Accurate and dependable, *always.*

You should know the facts about the REEVES advantages and economies in *your industry.* Our catalog, H-66, will tell you. Send for it today!

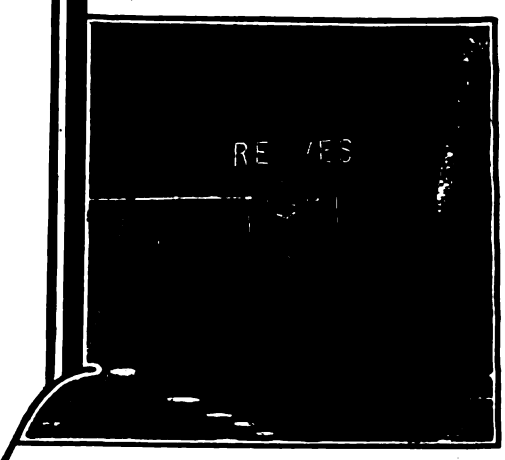
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Established 1887 *Columbus, Indiana*





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For Active Executives, Engineers, Superintendents and Managers

In Mills, Shops & Factories

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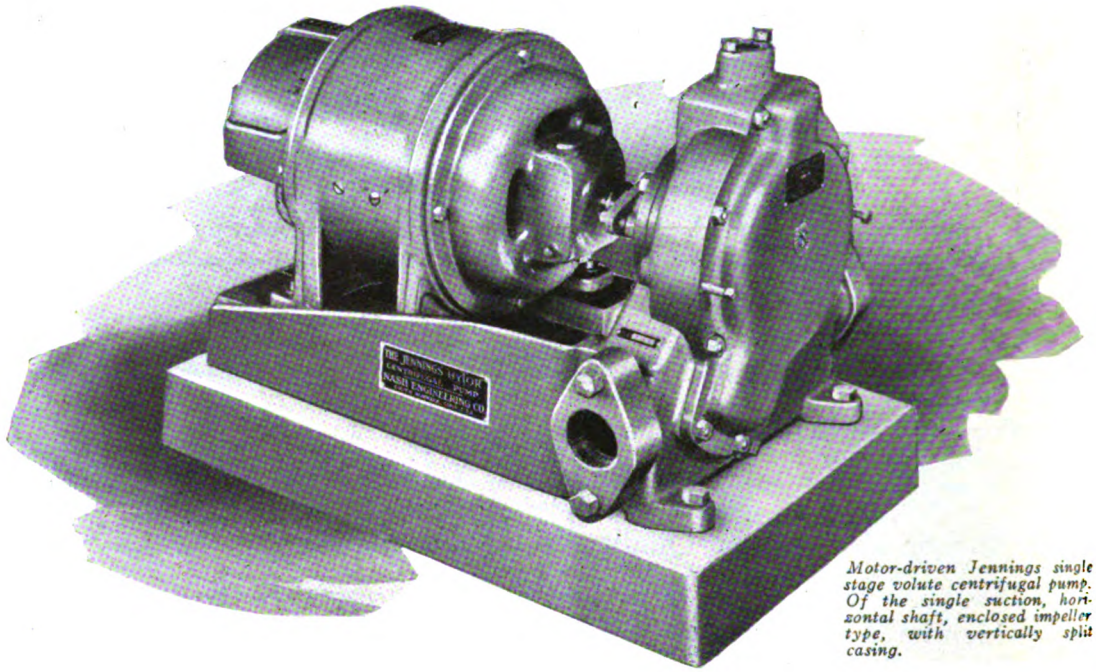
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Jennings Centrifugals are supplied in capacities up to 1,000 g.p.m. against pressures up to and exceeding 100 lbs. for:

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- *(d)* **removing condensate from heating systems, blow down from soot blowers and superheaters, exhaust drips from steam ejector air pumps and other auxiliaries**
- *(e)* **pumping refrigerator can and core water, evaporator feed, cooling tower and condenser water, screen wash water, oil engine jacket water, ash sluicing water**



Bulletin No. 52 is the one to ask for.

In order to provide a more compact, dependable and sturdy unit, the impeller in the Jennings Centrifugal Pump is mounted on a short, stiff bronze extension of the motor shaft.

There is only one stuffing box. No bearings in the pump casing. By merely unscrewing a few bolts, the head can be taken down without breaking the piping connections or distributing the shaft alignment.

Standard commercial speed motors are used. Shaft couplings are done away with. Efficiency is high—with a wide, flat characteristic.

NASH ENGINEERING COMPANY
92 Wilson Road, So. Norwalk, Conn.

Jennings Pumps

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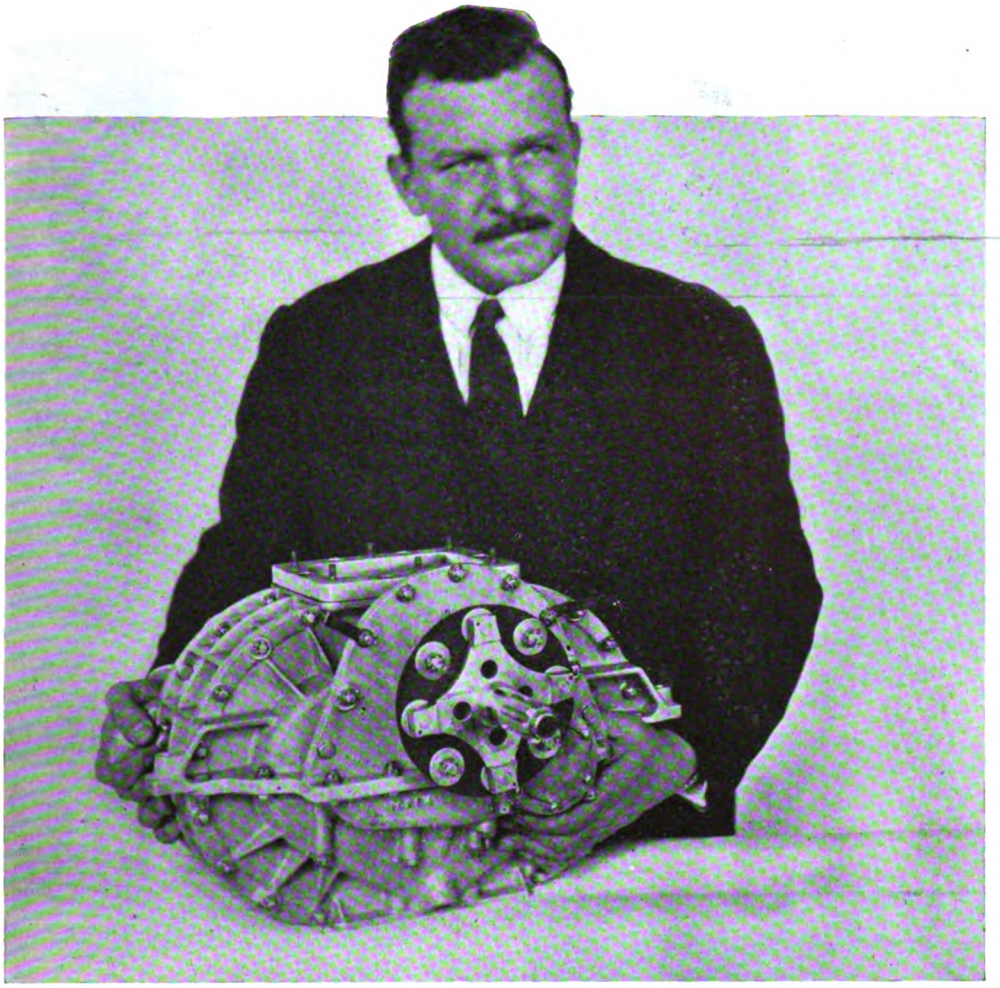


Fig. 1. Charles L. Lawrance, President of the Wright Aeronautical Corporation and inventor of the "Whirlwind" Motor

How the Wright "Whirlwind" Motor Is Built

Clockwork Accuracy, Selected Materials, Exhaustive Tests, Mark Production of Motor Weighing 2.3 Lbs. per H. P.

By

Charles L. Lawrance

Engineering achievement made the trans-oceanic flights possi-. A new type of air-cooled motor drove the planes for ap-oximately forty hours, stopping only for the sufficient reason at the gasolene gave out. When Colonel Lindbergh's motor s examined after its return, at the plant of the Wright Aero-utical Corporation where it was designed and built, it was und to be in perfect condition. It was not a special motor. e Wright Corporation is turning the same motors, the "Whirl-nds" or J-5's, out on a production basis.
This article tells of the refinements of shop practice by which s is accomplished. Manufacturers who keep abreast of the es will find it of absorbing interest.—*The Editors.*

THE motor which drove the planes of Lindbergh, Chamberlin and Byrd across the Atlantic, Maitland's across the Pacific and Byrd's plane, ain, across the North Pole, is the "Whirlwind" or J-5 odel designed and manufactured by the Wright Aero-utical Corporation, at its Paterson, N. J., plant.

It is a nine-cylinder, radial, air-cooled motor, which generates 220 b. hp. at 1,800 r.p.m. Its total weight, exclusive of exhaust pipes and flanges, starter, fuel pump, propeller hub-flange and bolts, is 500 lbs. The bore is 4½" and the stroke 5½", giving a total displacement of 788 cubic inches. The guaranteed fuel consumption per bl. hp.-hr. is .53 lbs. and the oil consumption is .035 lbs. both at the rated hp.

The nine-cylinder construction has been adapted because it permits continuous firing of every other cylinder around the circle, which would not be possible with an eight-cylinder arrangement. Thus the order in which the cylinders, operating on the four-stroke cycle, fire, is numbers 1, 3, 5, 7, 9, 2, 4, 6, 8.

The cylinder construction is as follows: An aluminum alloy head with cooling fins is shrunk onto a steel cyl-

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Fig. 3. The motor test house in which every motor is tested for five hours to season the valves and wear in the moving parts.

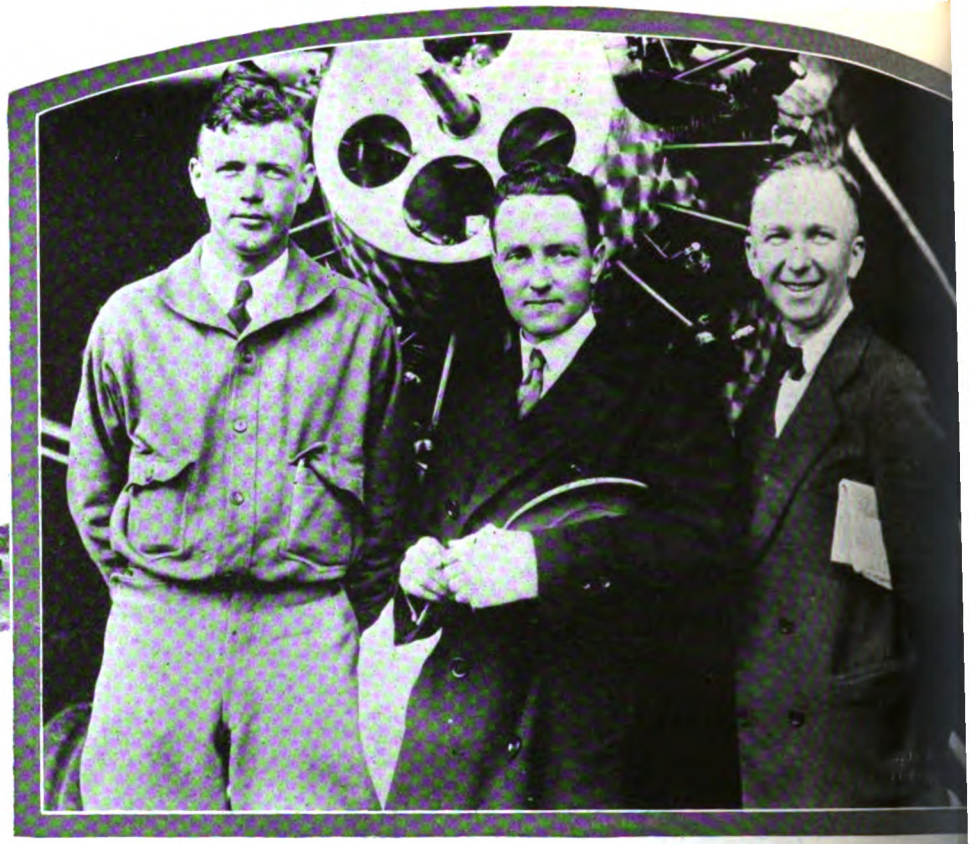


Fig. 2. The three pioneers of Trans-Atlantic flying: Lindbergh, Byrd and Chamberlin, whose planes were driven across the Ocean by Wright "Whirlwind" Motors.

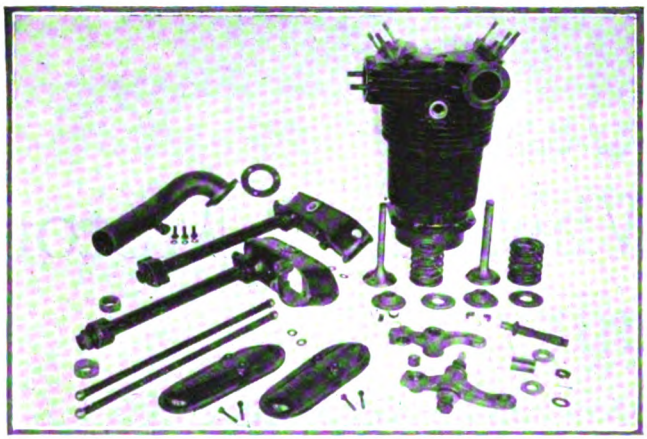


Fig. 4. One of the nine cyclinders dissassembled to show the class of machine work required to finish each of the parts.

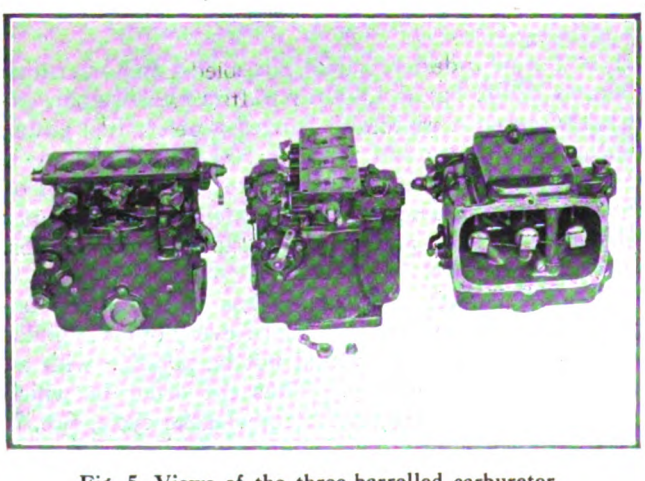


Fig. 5. Views of the three-barrelled carburetor. Each passage supplies an annular ring feeding three cyclinders.

inder sleeve (also equipped with fins), forged with a hold-down flange. The inlet and exhaust ports are at right angles to each other in the head. The inlet valve guides are of bronze and the exhaust of tungsten steel. The valve seats are of bronze and are set in the heated casting, to be held in place by its contraction, when it cools. The intake and exhaust valves are of low tungsten and cobalt-chrome steel respectively. They are of the tulip type. The exhaust valves are salt filled and sealed at the top with hardened plugs. Two spark-plugs are screwed directly into the cylinder head casting, without bushings.

The crank-case is an assembly of five aluminum alloy castings. It may be divided roughly into four sections, as follows:

(a) The front section and nose-plate, including the thrust bearing housing, magneto bracket and gears for driving magneto and cam.

(b) The intermediate section containing cam and valve-tappet mechanism and the front main crank-shaft bearing housing.

(c) The main section carrying the cylinder pad and induction passages.

(c) The rear section containing geared drive for fuel and oil pumps and tachometer as well as the starter mounting and the main oil strainer housing.

The single-throw, counterbalanced crank-shaft is machined from a chrome nickel steel forging finished all over. The shaft rides in four bearings: The ball thrust-bearing, the two main roller-bearings and a plain bearing in the rear

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Fig. 6. How the motor is mounted on the plane. The man standing is Giuseppe Bellanca and the pilot is Lieut. C. C. Champion



section whose sole function is to admit oil to the crank-shaft. The shaft is hollow for distribution of the lubricant to the connecting rod, crank-pin bearing, cam bearing and passages leading to the magneto drive bearing. Cylinders, pistons and piston pins are lubricated by the crank-shaft splash system. Rocker arm pins have grease gun connections.

The nine cylinders operate on the single crank-pin by a novel arrangement of rods. There is one master connecting rod whose crank end is made large enough to carry eight knuckle pins to receive the ends of the rods connected to the wrist pins of the other eight cylinders. The pistons are of cast aluminum alloy, the inside of the head being heavily ribbed for strength and heat diffusion. The pistons have two compression rings and one oil scraper ring above the pin and one compression ring at the bottom of the skirt. Oil is returned to the inside of the crank-case by way of a groove around the piston below the scraper ring and holes drilled through the wall. The wrist pins are machined from alloy-steel stock, oil-hardened. Aluminum alloy plugs at the ends of the pins prevent scoring the cylinder wall.

Two Scintilla magnetos mounted on the front section of the crank-case furnish ignition. One fires the front set of spark plugs and the other the rear set. The high tension wiring is heavily insulated and enclosed in metal manifolds. The Wright fuel pump is of the Viking internal gear type. It is fitted with a pressure relief valve and a by-pass valve so that the operator may pump fuel

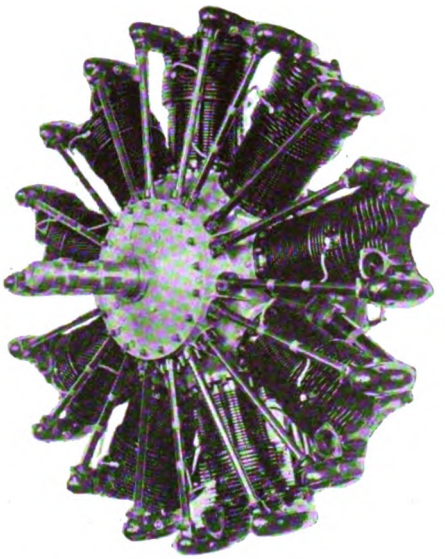


Fig. 7. Front view of the assembled motor. The cylinders fire alternately in rotation, acting upon a single crank by means of a master connecting rod to whose disc the other eight rods are linked.

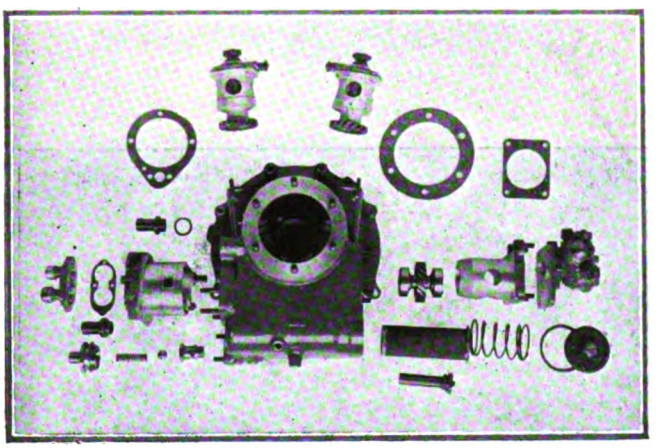


Fig. 8. Disassembly showing parts of the oil pump and strainer and timing gears.

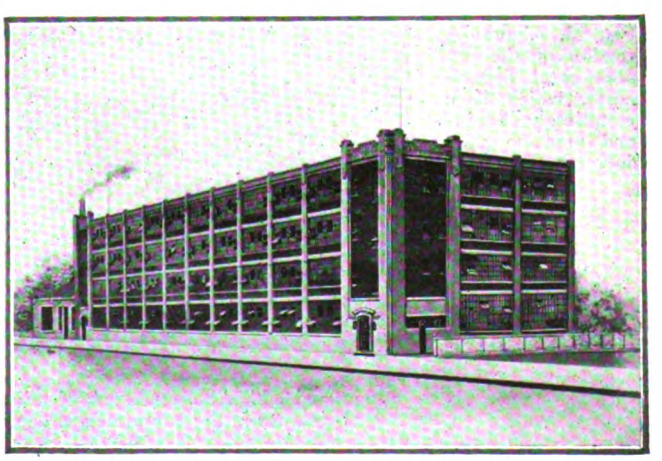


Fig. 9. Exterior of the main building at the Wright plant, Paterson, N. J.

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Fig. 10. Right: A section of the pattern shop where the master patterns are made for the aluminum alloy castings of the cylinder-head and crank-case.

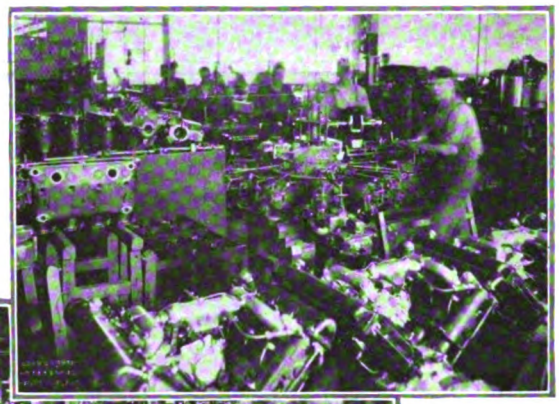


Fig. 11. The re-conditioning department to which used motors are returned for inspection and subsequent repairs, if any are necessary.



Fig. 12. The molding floor of the foundry where the aluminum alloy castings are made.

to the carburetor by a hand pump. The operating pressure on the fuel supply is four pounds per square inch, while the pressure on the lubricating oil is sixty pounds per square inch. It may be mentioned here that the minimum safe quantity of lubricating oil in the whole system is two gallons while the quantity circulated per minute is twenty-seven pounds. The temperature of the lubricating oil should be maintained at 120° F. but should never exceed 180° F. under the worst conditions. The inlet temperature of the oil is approximately 10° F. lower than the outlet temperature.

A three barrelled carburetor is fastened to an oil-jacketed manifold at the bottom of the crank-case main section. Fuel is fed through three branches of the manifold into three annular rings, each of which supplies three cylinders through intake pipes. One ring supplies cylinders numbers 1, 4, and 7, another 2, 5 and 8 and another 3, 6 and 9.

The Wright hand starter is of the worm type. The starting crank not only rotates the engine crank-shaft, but also turns the starting

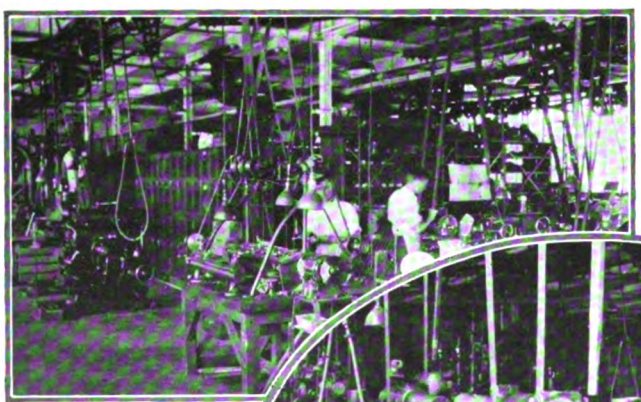


Fig. 13. Above: A section of the experimental department, which is a completely equipped machine shop devoted entirely to research.

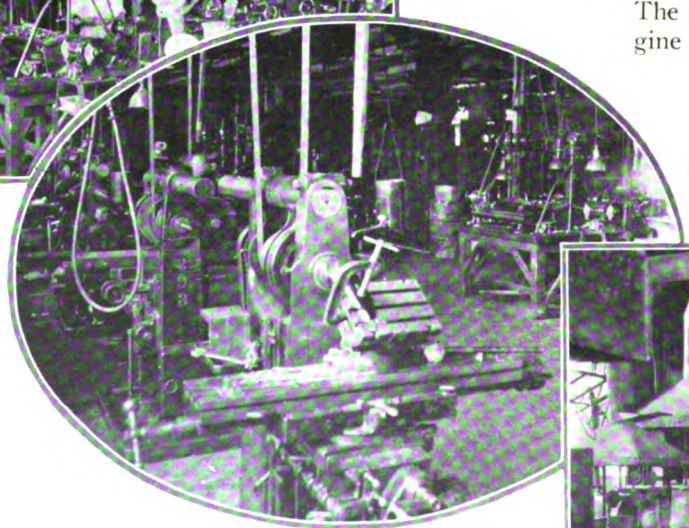


Fig. 14. Above: A row of milling machines in the experimental department.

Fig. 15. Below: Practically every piece entering into the construction of the motor is given some form of heat treatment in these electric and gas-fired furnaces.



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magneto. When the engine starts, the worm is thrown out of engagement but the starting magneto is kept in operation by the hand crank until the engine has picked up enough speed to fire regularly on the running magnetos. Kick-back is minimized by operating the starting magneto in connection with a trailing brush on the running magneto, which gives a greatly retarded spark. A clutch, designed to slip, protects the engine and the starter in case of a kick-back.

This sufficiently describes the type of engine used on all the trans-oceanic planes, for the purpose of this article.

The Motor in Production

As might be expected, the rapid development in airplane motors has introduced so many changes, in such brief periods of time, that models have become obsolete almost as soon as they reached the stage of practical operation. This has made the production problem a difficult one. Seven years ago, for example, the Wright Aeronautical Corporation was manufacturing the E type of

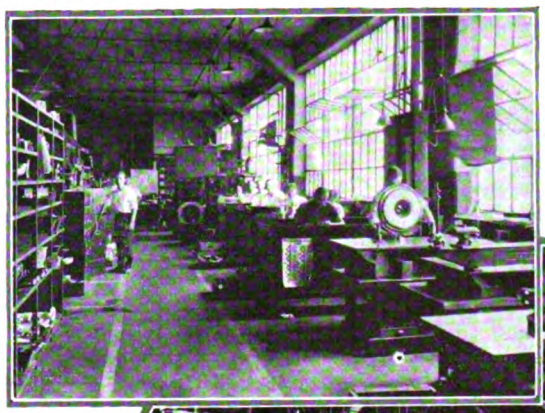


Fig. 20. Every part entering into the motor is subjected to rigid tests and inspection before going into the stock.

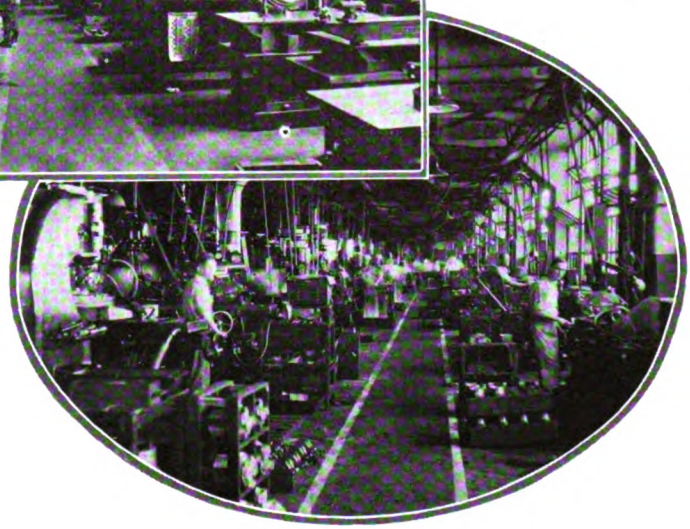


Fig. 19. Another section of the general machine shop in which are grouped the lathes, turret-lathes and automatic screw machines.



Fig. 18. Above· Rows of single and multiple spindle drills in the general machine shop.

Fig. 16. The gear department where he spur, bevel and twisted gears for he timing mechanism and pumps are made.



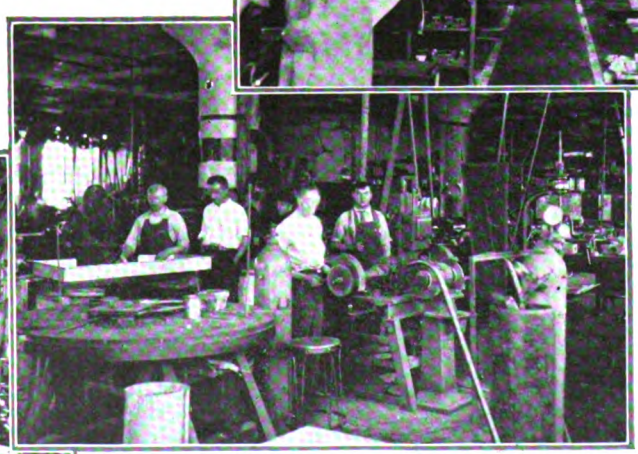


Fig. 17. The manifolds, cable tubes and other pipe connections are made up in the pipe shop shown above.

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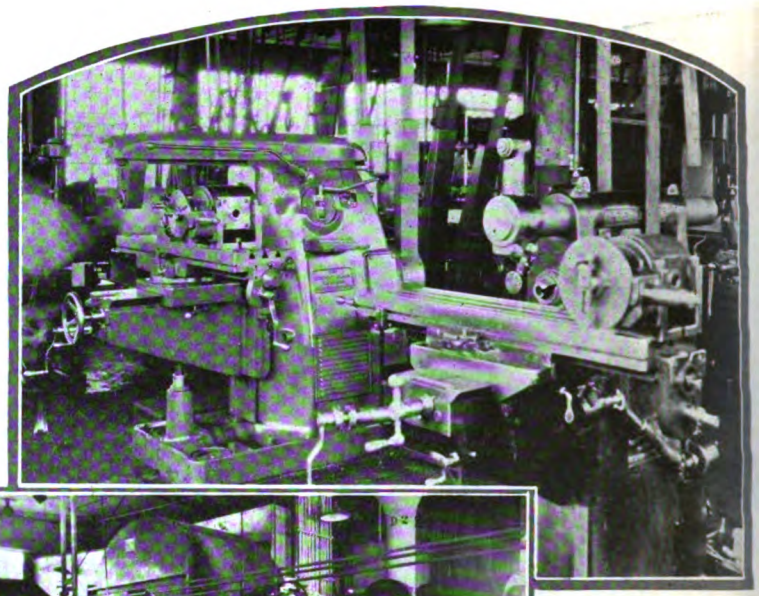


Fig. 21. Right: This is the type of equipment in the tool room which is exceptionally large because all production operations require specially designed jigs.

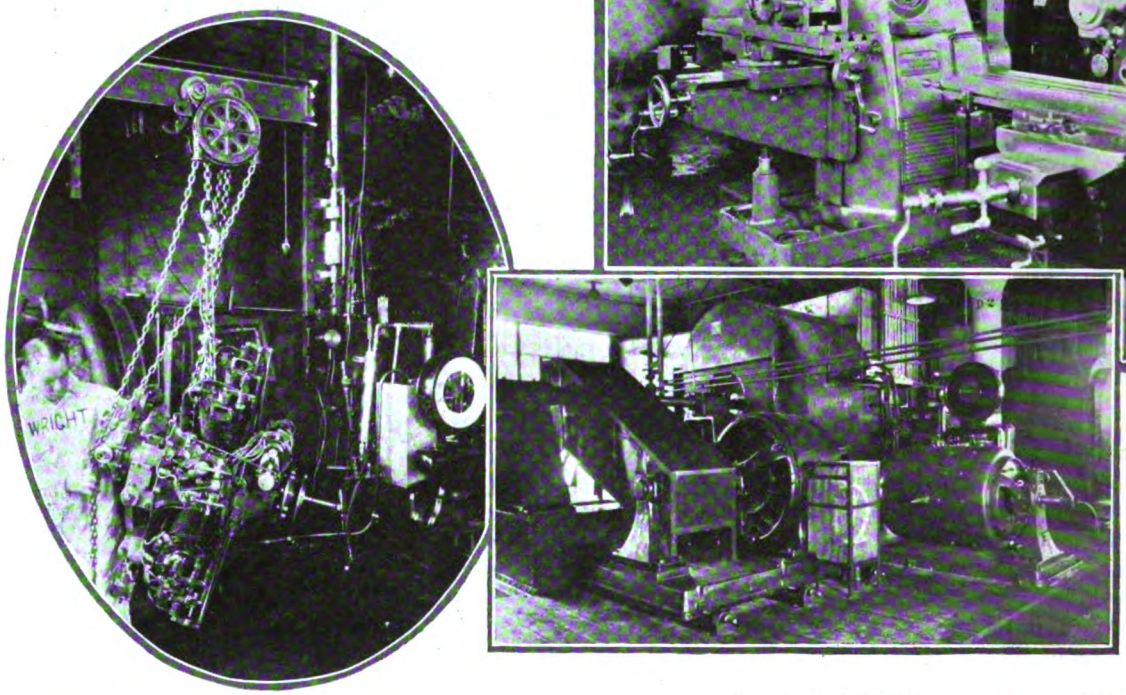


Fig. 22. Left: One of the electric testing dynamometer units. The dynamometer at the right measures the torque of the motor, while the blower in back is connected with the wind tunnel in which the motor is tested.

Fig. 23. Above: Setting up a motor for testing in the wind tunnel. The exhaust manifold appears above the operator's left shoulder while the dynamometer scale is seen at the right of the illustration.

water-cooled 200 hp. motors and the H type, which developed 300 hp. Both were eight-cylinder, 90° V-block motors. The corporation is still making a 550 hp. twelve-cylinder 60° V motor for *marine* use. The J type of radial air-cooled motors was originated by the Lawrance Company, which was bought by the Wright Corporation in 1920. The various models of the J type motors culminating in the J-5 class differ in changes of detail and design.

The J-5s have found so much favor with the Army and Navy Aviation Sections and with private operators of mail and commercial lines, that it has been possible since March, 1926, to put them in production. They are now being turned out at the rate of forty-five motors a month. And an increase to seventy-five a month is in contemplation. Incidentally a much larger motor, the R-1750, which develops about 525 hp. at 1900 r.p.m., has been perfected and is about to be put in production. Some fifty-two of these have already been ordered.



Fig. 24. Left: One side of the motor assembly room. The finished parts store-room shown at the left is actually in the center of the room.

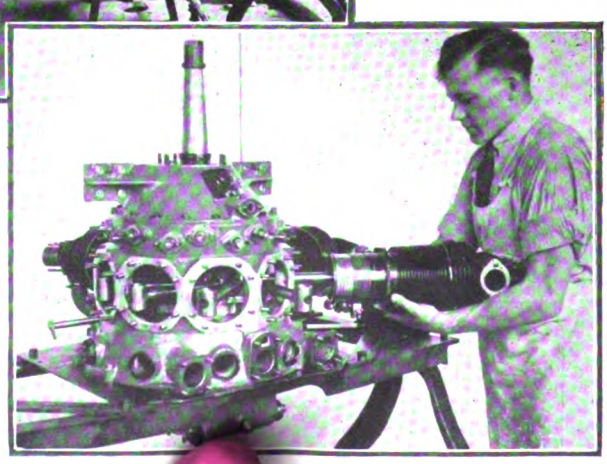


Fig. 25. Right: Assembling the cylinders on the crankcase. This view shows the relative positions of the connecting rods with respect to the master rod.

Manufacturing Process

It is difficult to conceive of any kind of machine manufacture, whose every step has to meet more rigid requirements, than those which surround the production of the Wright motors. To begin with, no finished parts are purchased, with the exception of the magnetos and carburetors.

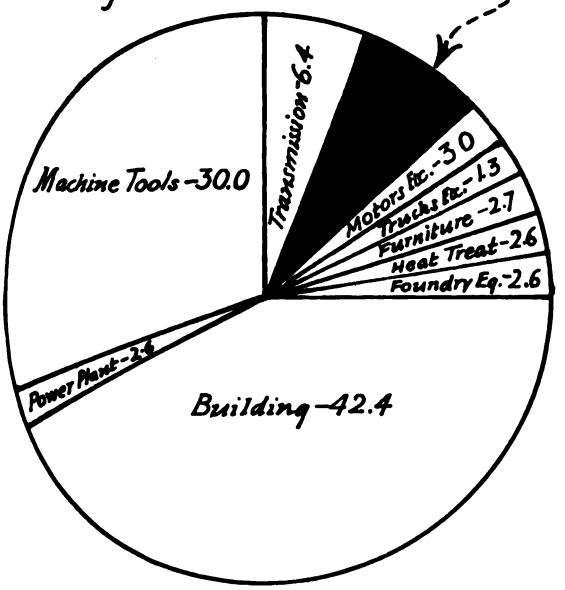
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How You Spend Your

$Investment Dollar$

Tool Room
6.4%
of the Plant Investment

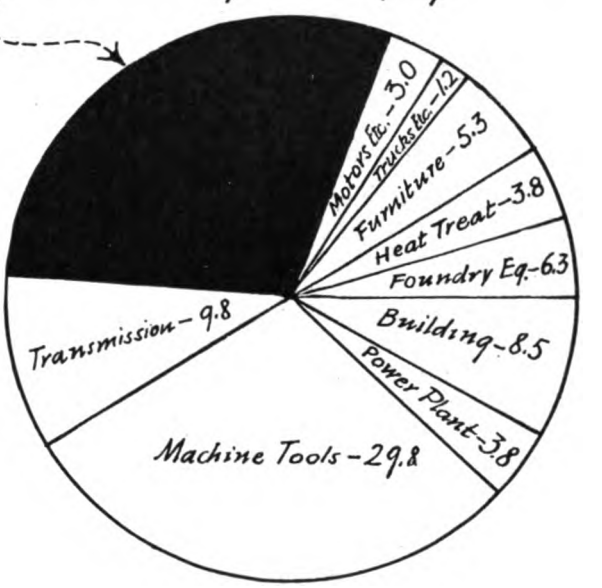


This is the money actually paid out for plant. The investment in the tool room is only one-sixteenth of the total;

But—

$Expense Dollar$

Tool Room
28.5%
of the Annual Replacement & Depreciation



It is over one-fourth of the annual burden of depreciation and replacements.

It Pays to Buy Small Tools on Quality and Performance

By Morgan G. Farrell

THE diagrams at the top of this page show forcefully the importance of the purchases of small tools and equipment for the tool-room and tool-crib. The figures are taken from the records of a maker of highly-finished, precision machines and of the small electric motors which drive them.

On the left is this manufacturer's total investment in plant, divided into the principal heads carried on the books, as—buildings, power plant, machine-tools, and so on. In this plant, the tool-room inventory, as of the first of the year, amounts to 6.4 per cent. of the total undepreciated plant investment.

On the right is the replacement and depreciation account for the year, segregated under the same heads as before. The tool-room inventory here amounts to 28.5 per cent. of the total.

Someone may object: "That's all very well for the plant you're talking about; but it seems to me to be all out of line with general practice in machine shops."

Let us see if it is. Here are some more figures. A manufacturer of automobile transmission units reports that his tool-room inventory is 11 per cent. of his investment in plant and that the annual replacement and depreciation in that department is 40.1 per cent. of the total for the plant. A hack-saw manufacturer reports

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7.7 per cent. and 29.1 per cent. as the corresponding figures in his business. Finally a builder of gasoline engines reports 10.8 per cent. and 45.3 per cent. as the respective ratios.

Of course, the figures will vary somewhat with the nature of the product but the variation between shops which keep the product up-to-date—and that means constantly changing models—is not enough to seriously modify the percentages of the diagrams.

It is the rapid rate of turnover of the tool-room inventory which makes the annual charges so large in proportion to the other fixed charges. The depreciation rate on buildings, for instance, is 2 per cent. in the plant from which the figures for the diagrams were assembled. On machine-tools, it is 10 per cent., on transmission 15 per cent., on shop furniture 20 per cent. On foundry equipment, which is comparable to the tool-room tools and machines (since patterns and flasks obsolesce rapidly), the annual rate is 25 per cent.

The rate for the tool-room is 45 per cent.

The tool-room inventory in this plant includes the tool-makers' machines, and transmission, appliances, attachments and adapters for the shop machines, jigs, special dies, cutters, hand, bench and portable tools. It also includes the workmen's tool and instrument sets and the bench appliances, as vises, throughout the shop. Some material, often classified among supplies, is considered to be part of the tool-room inventory, as belting, lacing, transmission, chain, blocks and similar items.

The maximum life of any model of the company's product is four years, at the end of which, all special tools become obsolete, except for repair work. Meanwhile a large percentage of the standard tools have been replaced several times. Some of them last two years and some only six months, although as the production manager puts it: "We buy nothing but the best that can be had."

Now this is a highly organized plant, whose cost and production methods rate one hundred per cent. No tool, not even the smallest, is purchased in quantity, until it has passed the severe tests of the Experimental Department. If it is approved as satisfactory, it is placed on the Purchasing Agents cards. He invites quotations only for such approved material. Samples of unlisted tools or supplies may be submitted to him, and, at his discretion, may be passed on for a test.

This company buys in the neighborhood of $75,000 worth of standard small tools a year and about the same amount of made-to-order tools, including jigs and dies. In the tool-room, there is a separate wood box with sliding cover containing not only the jigs but the gauges, drills, reamers and cutters for each operation on every part which goes into the finished product. Tool kits for each machine-tool are stocked on the same unit system. Interchangeable parts and attachments as well as portable tools are issued as required.

The unit system of tooling is growing rapidly in favor, as a time-and-money-saver. When a machinist draws a box for operation "No. A 196," he finds in it everything he needs for that operation. This takes him about five minutes, instead of the usual hour or two. In the plant we have been discussing, the box is delivered to him by a runner with the shop order, so that he loses no time at all.

Necessarily this system ires a considerable duplication of cutting tools. The increased investment is offset, first, by the saving in productive time and, second by the quality test requirement which increases the useful life of the tools, especially as they are inspected and conditioned before being returned to the shelves. The inspection furnishes an automatic check upon tool performance, since requisitions for replacement are charged against the operation number on the tool-expense sheets, which are sent periodically, to the cost section of the production department, to be segregated.

As the cost of each operation is posted progressively, any variation from month to month is immediately detected and the cause sought out and remedied. Defective tooling, the usual cause of such variation, is thus easily corrected. Similar methods are employed to determine the performance, not only of all the machine tools, but of hand, bench and portable tools as well.

This may sound like too much system, but the proof is that it is part of a general reorganization of an almost insolvent business, which is now competing successfully with a large competitive combine.

If the average annual depreciation and replacement account for the tool-room in a thoroughly systematized plant, such as this, is as high as 45 per cent., it is easy to imagine what it would be if tools were bought on price, instead of performance.

Even in the gasoline-engine plant mentioned earlier in this article, the rate is 67 per cent. and it is a well-run plant, at that. Here obsolescence is a dominating factor. Models are changed each year, so the tool-room turnover is enormous. A few months ago, this plant shipped three carloads of jigs and tools to a scrap dealer. Is it any wonder that no tool is listed as satisfactory until it has stood up under the most exacting service? It is bad enough to scrap so much material when it is unavoidable. Why add below-par tools to the losses?

It would be possible to go on citing other instances to show the importance of the tool-room inventory as an item of annual expense, but it is hardly necessary. These authentic figures are conclusive.

It is undoubtedly true of many factories that the small tool account is slighted as a chance to save money by spending it. If a machine of long life as a new planer were to be bought, there would be many a conference of the officials from the president to the foreman, before the purchase was authorized. Yet the planer will last almost twenty years—annual depreciation, five per cent.

Meanwhile the purchase of small tools, aggregating as much in one year as the entire cost of the planer, and replaceable every two years instead of every twenty, is conducted on no more logical basis than price. There would be some excuse for this method of procedure if the buying of small tools was not a constant repetition of orders. The same tools are bought over and over again. Consequently no more than a single performance test would be necessary to set up a standard.

If a cutter which costs 20 per cent. more than another of poorer quality, lasts twice as long, the buyer is evidently in an appreciable sum. A $50 cutter which lasts say 500 hours costs 10 cents an hour. A $[illegible] cutter which lasts 1,000 hours costs 6 cents an hour. The difference in favor of the second cutter is 4 cents an hour and the saving is 40 per cent. of the cost of the

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first. Or to put it another way, it takes two of the $50 cutters to last as long as the $60 cutter. Where is the economy in buying the cheap one?

The number of shops in which small tools are bought on a cost-per-hour basis may still be relatively small. But it is growing each year as more manufacturers become alive to the losses they incur by purchasing this class of equipment on a price basis.

More progressive buyers know from their experience in marketing their own product that any considerable difference between the sales prices of two competitors means one of two things—sacrifice of reasonable profit or sacrifice of quality.

Sooner or later they come to amount to the *same* thing, lower quality.

Performance, then, is the one sound basis for purchasing small tools, and this goes for everything that is stocked in the tool-crib and tool-room and used in the shop, from machinists' hammers to light machine tools.

A large enough slice of the investment dollar and a much larger slice of the expense dollar go into these small tools. There is plenty of margin for savings in each of them. So much so, that records show that the economies effected by buying the tools on a performance basis are conspicuously reflected in the year's profits.

National Machine Tool Builders' Exposition at Cleveland

September 19 to 23, 1927

THIS is a reminder to our readers to attend the exposition of the National Machine Tool Builders Association to be held at the Public Auditorium, West Annex and Arcade Annex, Cleveland, from September 19th to 23d. No one who is interested in mechanical production can afford to miss it.

Here for the first time will be brought together every machine tool and accessory essential to production. Three hundred carloads of equipment have been shipped by some two hundred manufacturers for display at the Exposition. *Most of the machinery will be in operation.* The makers of the machines will be present to explain and to inform visitors.

As the casual public will not be admitted, the attendance will be limited to self-identifying registrants. Thus there will be ample opportunity for those, who are seriously interested in acquiring information about the machines, or who have production or engineering problems to solve, to make inquiries and investigations.

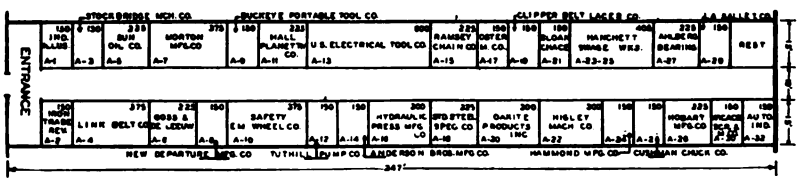
Machines of larger size and capacities than any yet shown will be on display, while new developments in design and efficiency will be introduced. Moreover, there will be a greater variety of types of machines, accessories and material than ever before shown in America.

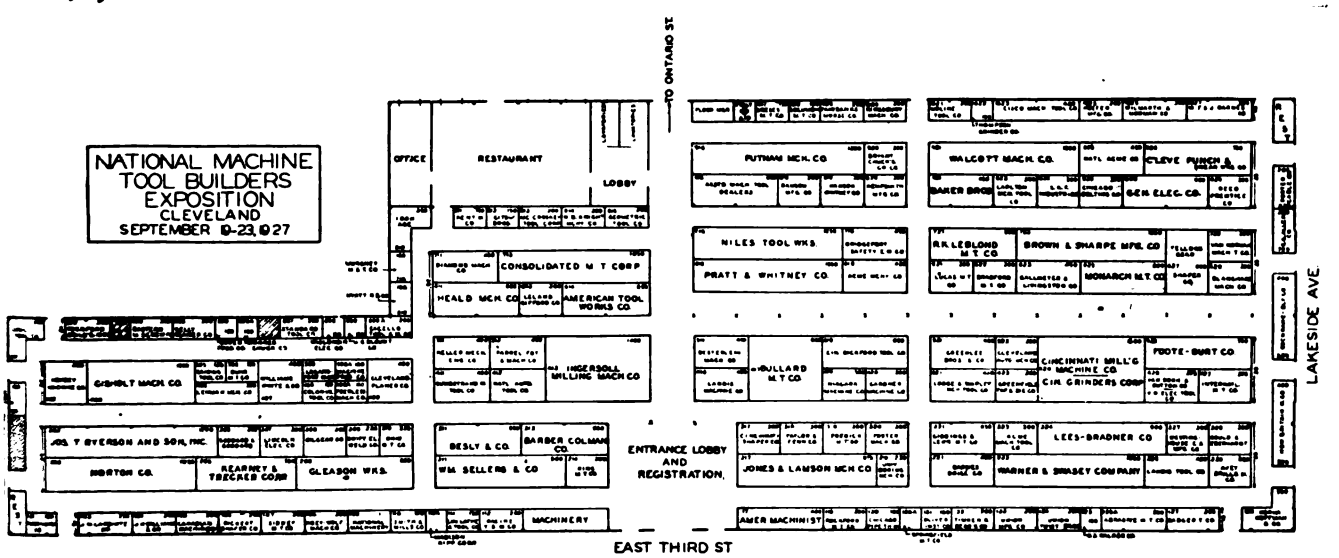
The Exposition will therefore be a comprehensive view of all the latest accomplishments of the master minds of the machine tool industry and of the applications of their newest products to all industries.

The Committee on Exposition includes: J. Wallace Carrel, vice-president, the Lodge & Shipley Machine Tool Co.; P. E. Bliss, vice-president, the Warner & Swasey Co.; H. W. Dunbar, assistant general sales manager, Norton Co.; O. B. Iles, president, International Machine Tool Co., and E. J. Kearney, secretary, Kearney & Trecker Corp. Roberts Everett is exposition manager.

INDUSTRY ILLUSTRATED will have Booth Number One in the Arcade Annex, of whose facilities our readers are cordially invited to avail themselves.

CANOPY ARCADE
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Use the One Best Chuck for Every Job

How to Care for Chuck Equipment So It Will Last

By H. R. Logan

CHUCKS are so common as applied to lathes and other machine tools that we all take them pretty much for granted. If ever a thought is given to their origin, it is perhaps natural to assume that they suddenly blossomed into full bloom—that they reached rather quickly their present state of efficient design and operation. But such is not the case. They have had an interesting family history like every other piece of modern equipment. Do you realize that the chuck did not have its original ancestor in the metal working industry at all, nor even in wood working?

The potter's wheel was the Adam among chucks. To its revolving disc mounted at the upper end of a vertical shaft, the potter placed his lump of clay. Simple adhesion between the somewhat sticky clay and the disc, together with the force of gravity, is all that held the clay in place.

From these beginnings grew the present day metal working chuck, an early step in the development of which was the adoption of screws or screw dogs attached to the face plate of a lathe to hold the work in place. Another early attempt to hold the work on the face plate was to fasten to the latter a block of oak and turn in this a recess into which could be driven by a sledge the metal piece upon which lathe work was to be performed —admittedly neither a quick nor secure way of accomplishing the purpose.

In the early jaw chucks, which came later, the jaws

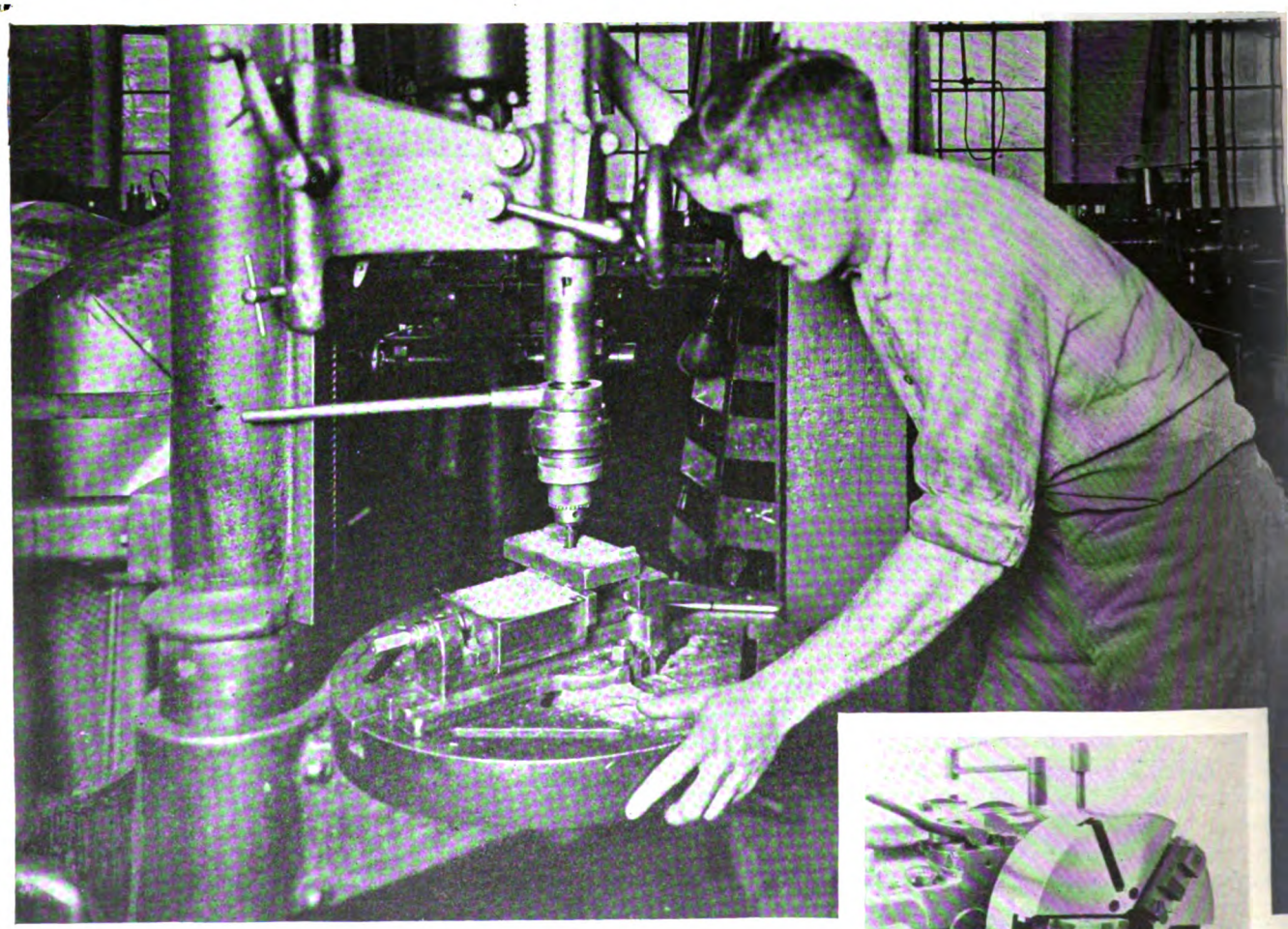


Fig. 1. Stout and simple chuck that is especially adapted for tapping operations.

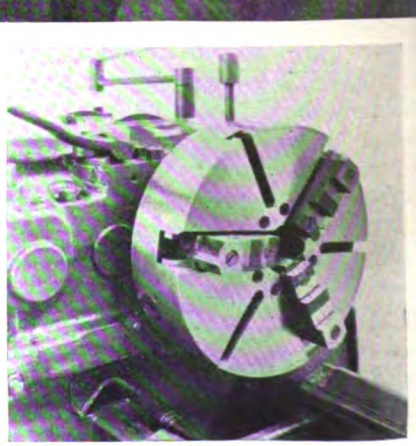


Fig. 2. This heavy-duty, universal, scroll-chuck (at right) was designed for turret-lathe work. Working parts are of alloy steel and all gears are heat-treated to give maximum toughness.

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Fig. 4. Below: Manually operated chuck with great gripping power machining cold rolled steel.



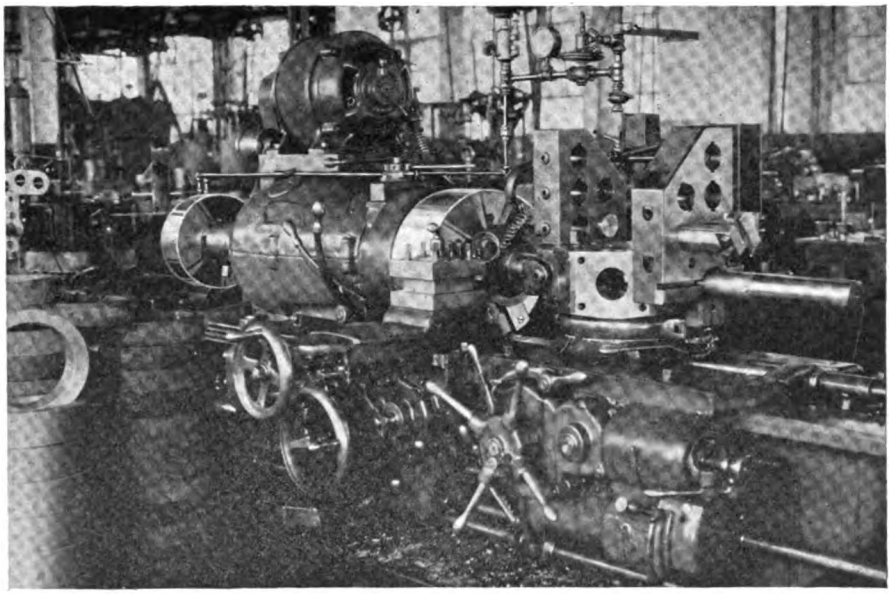


Fig. 3. Above. A 17″ three-jaw universal, wrenchless, air operated chuck on an 18″ motor-driven turret-lathe. The jaws are opened and closed by operating the compressed air valve in the small horizontal pipe over the chuck.

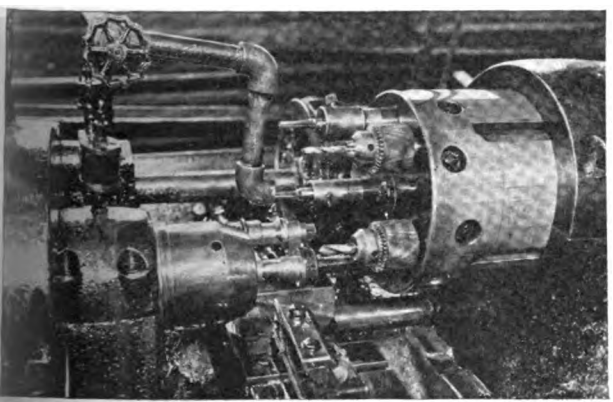


Fig. 5. These drill chucks are especially adaptable as tool-holders for automatic screw machines and turret-lathes.

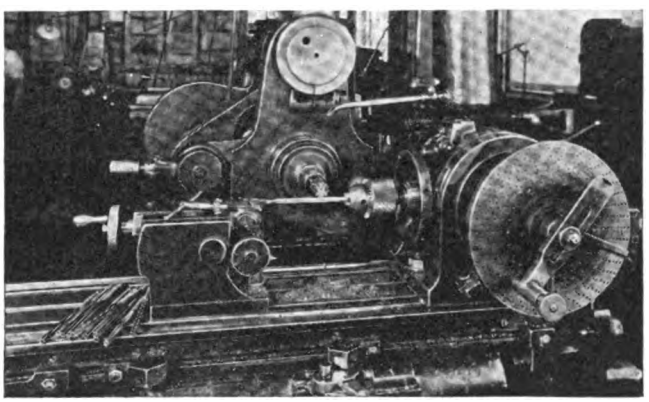


Fig. 6. Here the handy drill chuck is used to hold a reamer while the flutes are being milled.

themselves were called upon to do little more than center the work, after which set screws in each jaw were tightened to keep the piece from slipping.

Then followed the jaw chuck which at first glance pretty much resembles the modern chuck, but in operation was vastly different in that each jaw slid independently in a slot in a face plate to which it was clamped by bolts at the back.

As contrasted with the lightness of weight and the crudity of design of the earlier chucks, are the rigidity, strength and accuracy of the modern chuck. But it is not to be expected that any one chuck, no matter how well designed and constructed, will fill every chuck need. There is a one best type of chuck for every kind of job. It is the part of good management to see to it that requirements are matched with equipment having the proper qualifications. The quality of the work, its character, the grip required, and the quantity of pieces to be machined, play a large part in the choice of the right kind of chuck. Only if you have the one best chuck for a particular job can you expect to get the most possible out of a machine tool.

And the choice is fairly large, for there is the independent chuck at one end of a rather comprehensive list which includes universal and combination types, the various provisions for inside or outside grip, special chucks for specific purposes, the geared scroll types, air operated outfits and so on, to say nothing of the chucks for planers, the type known as drill press vises and milling machine vises, and the great variety of drill chucks.

While it is not the object of this article to delve deeply into the technical refinements of the various types, it is well to note those points which affect the special adaptability to fulfil more exactly the various requirements which chucks are called upon to meet.

First there is the independent chuck—a logical development from the face plate. It gets its name from the fact that each of the jaws is operated by a separate screw quite independently of the others. Thus it is that odd sizes and shapes may be readily accommodated, which makes this type the most adaptable of all for regular machine shop practice.

Most independent chucks are made with four jaws since this arrangement lends itself best to a greater variety of work than would be possible with but three jaws. In construction a strong iron body with hardened

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steel bearing generally gives sufficient strength for the ordinary work, but a steel body is available where there are demands calling for exceptional grip or unusually severe usage.

There is always the temptation to hold pieces larger than the chuck itself—a practice which the wise manager will discourage, for it puts undue strain on the chuck.

For machine tools over thirty-six inches in diameter, there are available independently adjustable face plate jaws which are bolted to the face plate of the lathe. This in effect provides an independent chuck of large capacity.

Next up the scale of chuck development is the so-called universal chuck. The word "universal" does not apply to the classes of work which may be done on it, but rather to the operation of the jaws. It means that the jaws are all operated at once (universally) when a wrench is applied to any one of the pinion heads.

It is perhaps well to note that with the universal type of chuck three jaws rather than four are preferable in that if the stock being worked on is slightly out of round, all four of the jaws do not grip. It is like a three-legged table versus a four-legged one. No matter how uneven the floor, all three legs get a good footing whereas with four legs, one may not touch the floor at all.

One method of accomplishing the "universal" or simultaneous action of the jaws is by the actuation of a "scroll" or spiral-threaded disc which itself is revolved by a pinion gear operated by a wrench. It is this arrangement which gives the name "geared scroll" to this type of chuck. Since a tremendous leverage is obtained in this class of chuck, it gives just the firm rigid grip so much needed for the heavy work handled on turret lathes. Scroll chucks by their very nature cannot have the same degree of mechanical accuracy as the other type of universal chuck, but for general manufacturing purposes they serve excellently.

Then there is that quite obviously named "combination" chuck which has the combined qualities of both the independent and the universal types. In other words, its jaws may be operated all together as in the universal chuck, or each jaw may be worked separately as in the independent chuck. This feature is of large importance to production because it is a great time-saver where

(*Continued on page* 86)

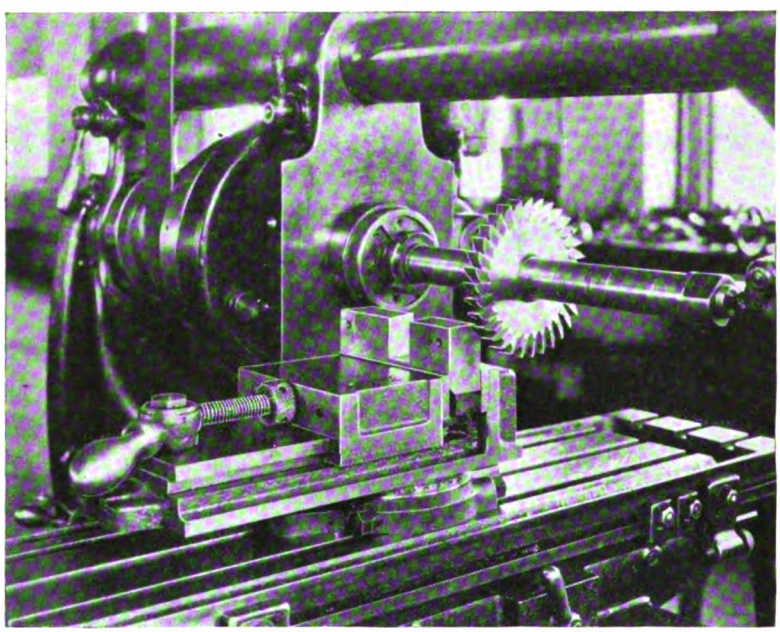


Fig. 7. Left: A milling machine chuck with all parts including handle below the hardened steel jaw tops.



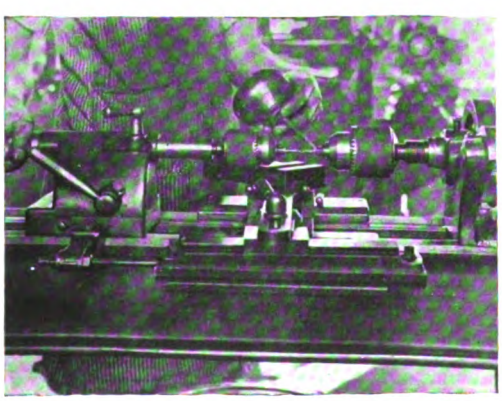


Fig. 9. Above. Two chucks are used here, one fixed to hold the piece, the other to rotate the cutter.

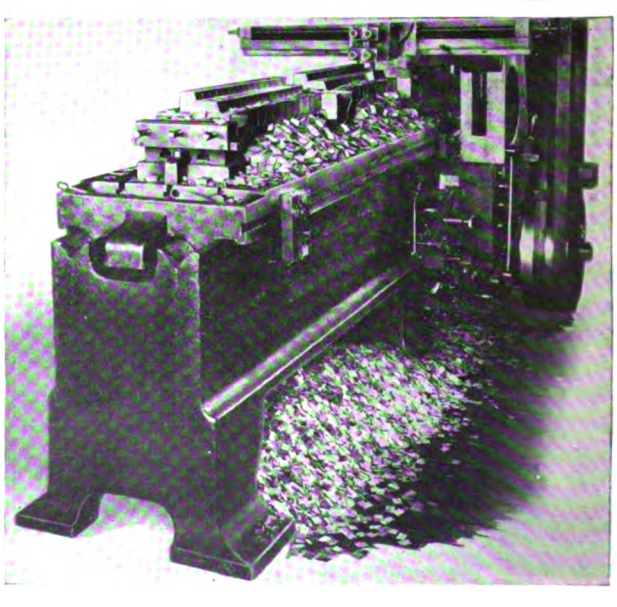


Fig. 8. Above. This is a novel use of a drill chuck. It is driven by the high speed portable air-drill clamped in a vise and is lapping small bushings.

Fig. 10. Left. Planer chucks must be so sturdily designed and rigidly clamped that the work cannot rise. The chips are evidence of the strain to which this one is put.

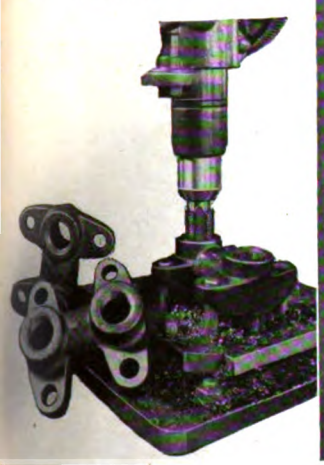
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Cost Per Hour—Not Price—Is the Real Test for Drills, Reamers, Taps and Dies

Some Actual Results Obtained by Improvements in the Manufacture of Drills, Reamers, Taps and Dies

By F. A. Westbrook

Fig. 1. The kind of production operation for which short-shank taps are especially suitable.



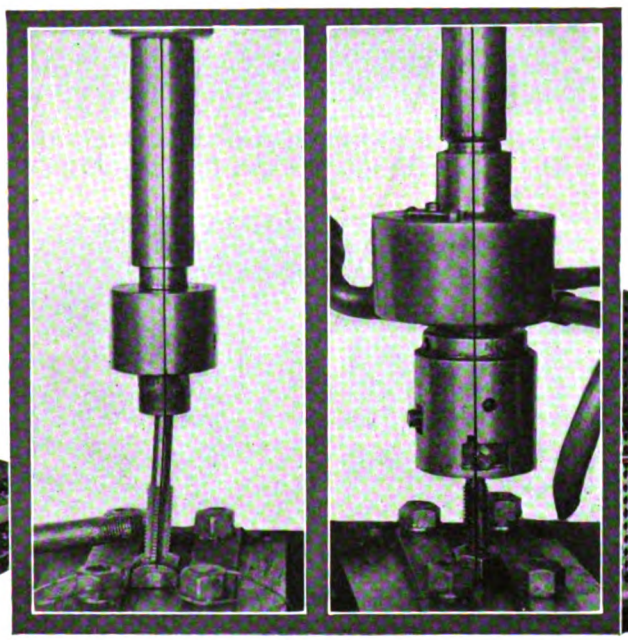


Fig. 3. Testing a staybolt tap under actual working conditions shows up any possible weakness.



Fig. 2. The tap must be properly supported close to the work; otherwise it is sure to get out of line as shown on the left.

THE old saying that you can't get something for nothing is just as true when it comes to selecting drills, taps, dies, etc., as when buying a suit of clothes, good quality costs extra money in the first place but it can be made the basis of real economy in almost all cases.

Drills, reamers, taps or dies, especially the two former, seem like such extremely simple tools that there is some excuse for users not to pay very much attention to what they are getting. It is, however, a significant fact that, when an intelligent management looks into all the details relating to its manufacturing processes some very startling results are likely to be developed.

Take, for instance, the selection of the proper kind of drill for a specific purpose. A certain manufacturer who drills about 8,000 holes per day formerly used up about 12 drills daily to do this amount of work. By substituting a different type of drill, which was hardened first and ground to size afterwards a dozen drills lasted him six days. In other words, the service was increased 600%. Naturally it is worth while to pay somewhat more for tools like that for the saving is not only in the drills but in increased production made possible by so greatly reducing time lost in charging tools and lowered maintenance.

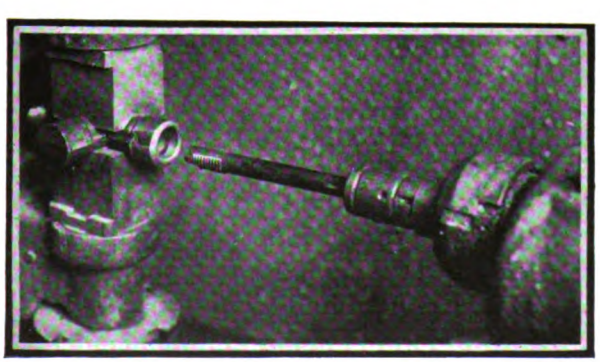


Fig. 4. A case in which unsupported length of tap shank is no objection, since the work itself guides the tap.

Drills being apparently such simple tools, it will be interesting to see to what lengths the progressive manufacturers go in order to turn out a good product. It will show that it is well worth

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while for the user to familiarize himself to some extent with these in order that he may appreciate why certain methods of making drills give better results than others and why the first cost may be greater for some drills than for others. In milling the fluting of the drills it has been found preferable, by some manufacturers at least, to cut one flute at a time, turn the drill through 180 degrees after the first flute is cut and then mill the section with the same cutter. This secures uniformity of depth and thickness of web without which the cutting edges will be unequal, especially after regrinding, and cause the drill to "run out."

Spiral flutings must be designed with just the right angle so that the chips will clear and not be ground between the drill and the hole otherwise the power required to drive them will be unnecessarily great and the breakage too frequent. There is no use in paying for power to grind chips.

Some very interesting figures have been developed which show the forces exerted in drilling and which have led to modification in design. Suppose we take the every day instance of a one-inch high speed steel drill with a feed of .018 in., peripheral speed of 85 ft. per second drilling in thirty and forty point carbon rolled steel. The corresponding pressure required on a drill of good design is 1825 lbs. Obviously anything which tends to make an increase of this pressure necessary increases breakage and the frequency of sharpening, as it all comes on the cutting edge. If the web of the drill becomes thicker the necessary pressure increases in direct proportion. Consequently, if the web becomes thicker toward the butt of the drill it becomes thicker on the cutting point after repeated sharpening and the chip space in the flutes also becomes smaller. The result is that more power is consumed and more wear and tear takes place the longer the drill is used so that it is almost a disadvantage to have the drill last too long if something cannot be done to correct this difficulty. The remedy is actually very simple. The original idea, perhaps one might say the traditional idea, of increasing the thickness of the web toward the butt was to give increased strength against torsional stresses. Like many such things the idea is all right but when some analytically minded person thought of making some actual tests he found that our one-inch drill required a driving torque, when new, of 732 foot-pounds and that, if it had a uniform web thickness throughout its length equal to that at the point, when new, it would take a torsional stress of 6,613 foot-pounds to break it, a factor of safety of 9. This naturally exploded the idea of the necessity of webs of increasing

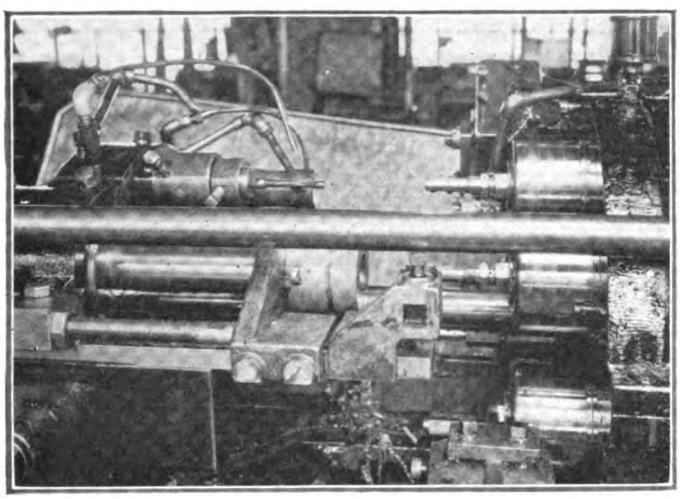


Fig. 5. Rotating die-head adapted to an automatic screw machine.

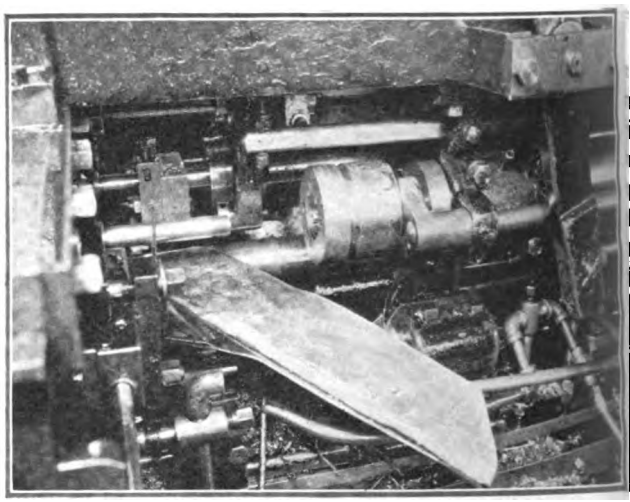


Fig. 6. Another adaptation of the rotating die-head to a different type of screw-machine.

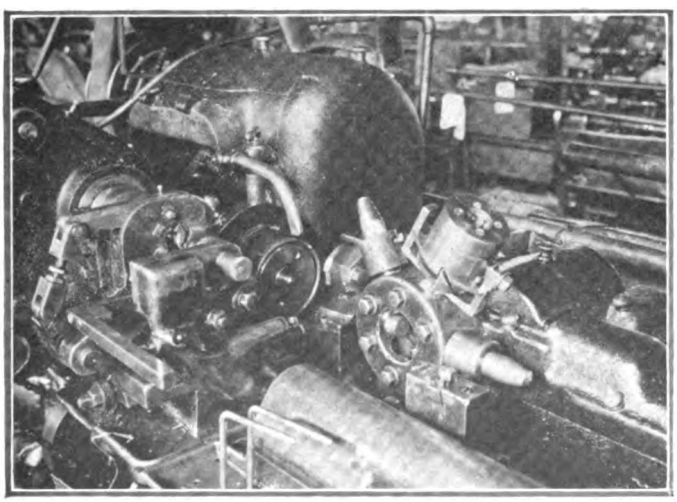


Fig. 7. How the self-opening die-head is used in the turret of an automatic machine. The closing attachment has functioned and the chasers are ready to cut the next thread.

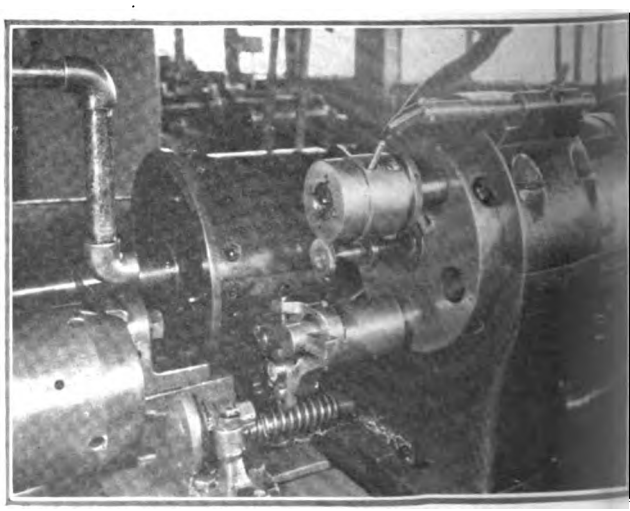


Fig. 8. A die of this type is opened by a self-contained trip, insuring a straight thread, and closed by a lateral movement actuated by a stop or by hand.

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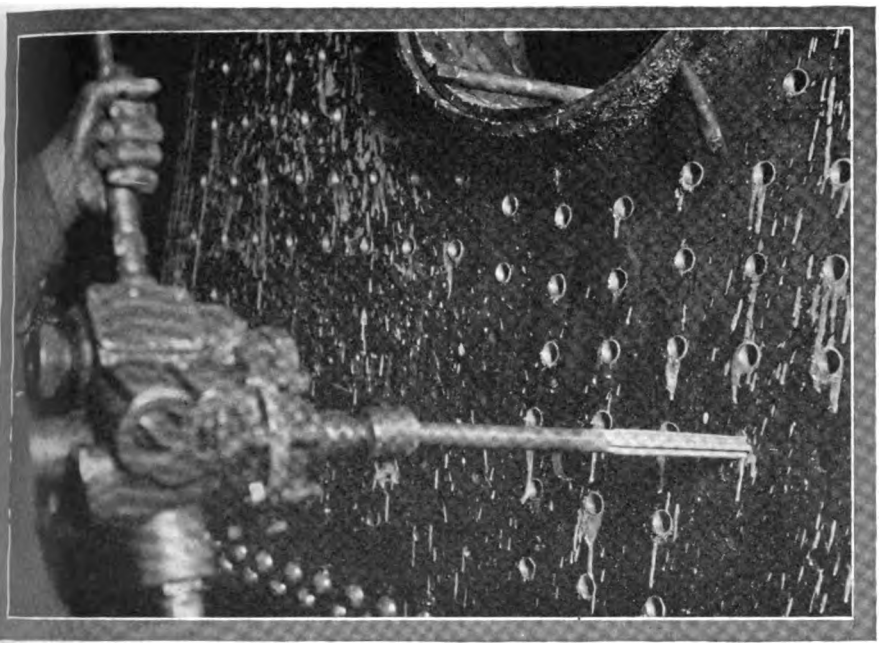
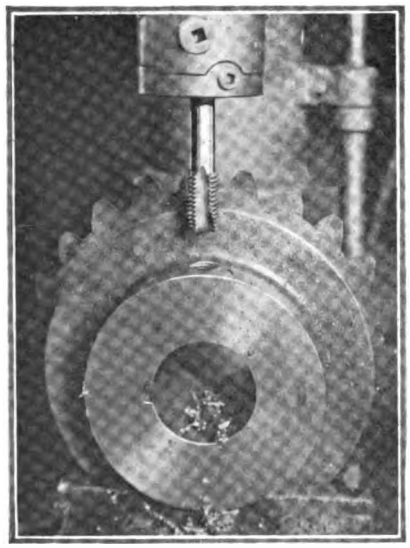


Fig. 9. Taps for staybolt holes must stand hard service since they are usually driven by air-motor tools held by hand.

Fig. 10. A common tapping operation, yet one which calls for rigid support for the tap.

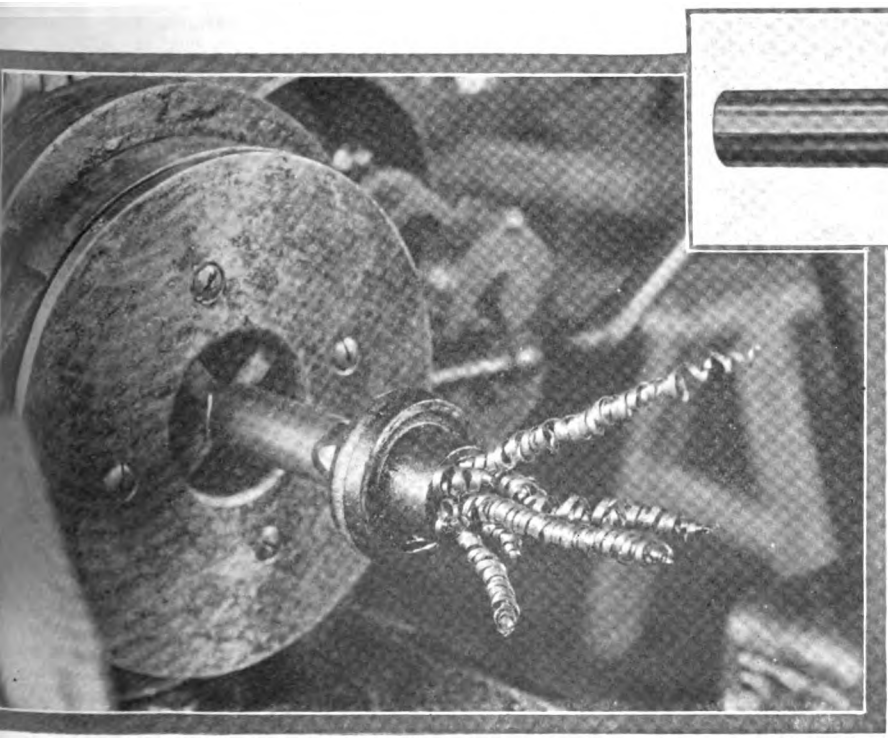


thickness and the best drills are now made with uniform webs.

Refer again to the consumer who so greatly increased the service he secured from his drills by changing to a make which is ground after hardening. The reason for this improvement is that, if the hardening is done after grinding, some distortion occurs, so that as the drill passes down into a deep hole it tends to bind and jam. Of course, breakage, waste of power, perhaps inaccuracy, will result. However, if the drill is ground down to the finished diameter on a centerless grinder, it will be accurate and these troubles will not occur.

Finally, special grinders have been developed and placed on the market whereby proper cutting and clearance angles may be secured when the dull point is reground. It must also be remembered that different degrees of hardness and other variations in design are called for depending on the metal to be drilled, size and depth of hole and so forth.

After considering all this one begins to have more respect for drills. But the acquisition of the facts, improvements in design based on the facts and the production of drills of uniform quality means an expensive organization. Progressive tool makers have research departments where many kinds of tests are under way continually. This includes work on different kinds of material, how many holes can be drilled before breakage occurs without sharpening and with sharpening and after how many holes it is best to regrind. In addition to such tests as these, and there are many others, inspections must be made at every operation in the factory and inspectors are even maintained at the steel mills by



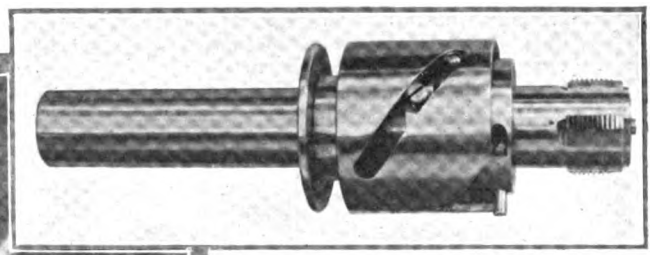


Fig. 11. An automatic tap of the revolving type by which the withdrawal is readily effected.

Fig. 12. Left. The clearance and the angles of the cutting edges of this tap have been designed to give a continuous cut as shown by the curled turnings.

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some producers to check up on the raw material of which the drills are made. The knowledge acquired in this way furthermore places the manufacturer of drills in a position to work out special problems for his customers and to give advice on matters pertaining to drilling, such as the speeds and feeds to use under varying conditions.

In view of the foregoing it is not hard to see why drills furnished by certain manufacturers cost more than when obtained from others but it is perfectly safe to say that the increase in cost is in very much smaller proportion than the increase in service secured from them.

The same may be said of taps, reamers and dies. A test was made not long ago by a user of a certain make of tap which had been very carefully designed and manufactured. Eighteen 6/32 in. machine screw style taps were used in automatic tapping machines on steel, brass and copper punchings 3/32 in. thick, having punched holes. The average production per tap was 39,200 threaded holes without grinding, which speaks for itself.

One reason why these taps did so well was because attention was paid to making threads with taper relief and which were correct in lead.

Another important matter is to select the right design for a given use. Briefly, four-flute machine screw taps should be used in work where the chips break up and work out of the flutes by floods of lubrication. The four-flute type is also proper in the large sizes, where the chips can get out through the flutes. Two-flute taps should be used where the chips are most likely to clog and the three-flute type for intermediate cases. Spiral, fluted taps are recommended by manufacturers for tapping thin sheet brass and steel and they work well in automatic tapping machines. Spiral, pointed taps are applicable for through holes. With these the cutting is done by the points which are designed to force the chips ahead of the cut. Perhaps the most important matter to bear in mind in relation to prolonging the life of taps is that tap and work must be carefully lined up. If there is misalignment the wear is excessive and early breakage may be expected.

There is also a type of adjustable tap in which the internal cutting is done by means of chasers which have a tripping action to cause the tap to collapse automatically for withdrawal from the hole. They are made for the larger sizes of work from 7/8 in. to 7 in. in diameter. The chasers are supported for their entire length by a core-piece to prevent their tilting and cramping the slots, thus making taper threads. These tools are adjusted by two adjusting screws in a collar which carries a control lever and may be adjusted without removal from the holder. The chasers are easily removable. Standard grinding equipment is suitable for sharpening them. This type of tap, of course, is a time saver and in order to do good work must be made with care. For this reason it is not a cheap tool to buy but in many cases it is very economical to use.

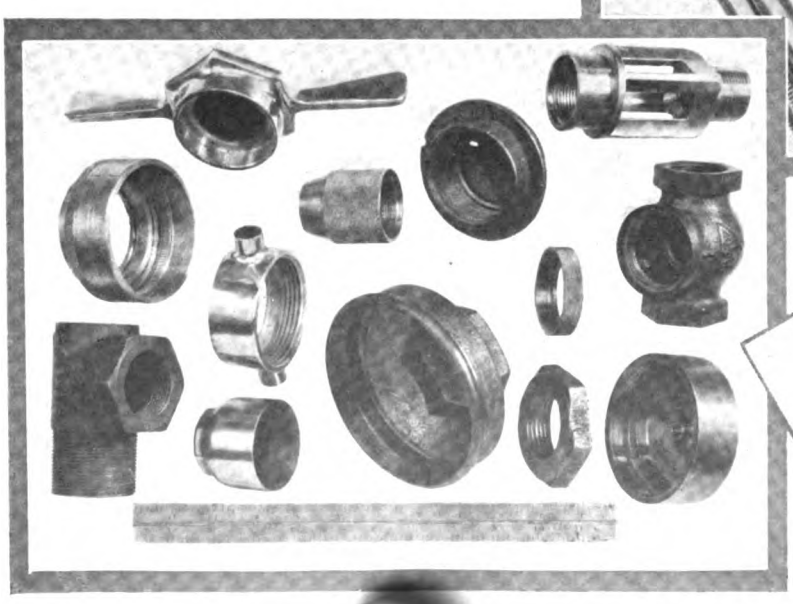
For tapping jobs, which cannot well be done on stationary machines, two types of portable tapping machines have been developed, one of which operates by compressed air and the other electrically. As might be expected, it takes an experienced man to hold these square

(*Continued on page 92*)



Fig. 13. Special taps like these are made to suit conditions for which standard taps would not do, as for cutting square threads, large diameter or taper threads.

Fig. 14. These are typical machine parts suitable for standard tap application.



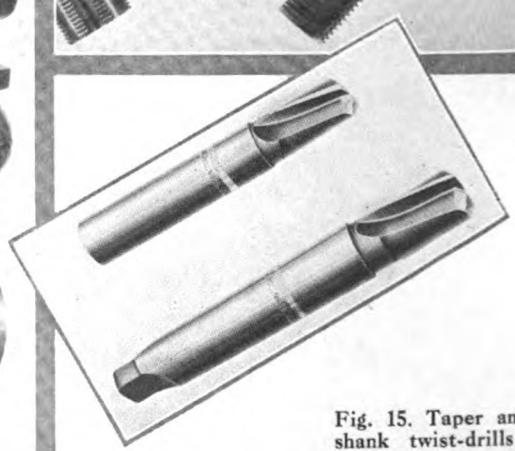


Fig. 15. Taper and straight shank twist-drills designed for heavy usage with long life.

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"We are planning to partition off spray rooms, and R-W hardware is specified for the bi-parting doors.

"The expense of one spoiled paint job, including the labor of removing the finish and doing the job over, would pay for several sets of door hardware."

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When to Use Power Bench Tools to Speed Up Production

Easily Taken Down and Set Up Again These Machines Make the Whole Shop More Flexible

By Henry Kies

TO one who thinks in terms of quantity production, the well and finally planned machine shop seems to be the last word in efficient manufacturing. And so it is, for a machine shop. But there are plenty of operations in the making of generally used commodities which cannot be performed on a series of permanently fixed machines. For one thing the parts being made are too large in themselves and too small in number to warrant the use of machines big enough to receive them and of handling equipment to transport them. Then again the operations are so varied that they could not be done simultaneously on a single machine or two, but would demand an equipment whose cost would be out of all ratio to the work to be done. It might even be cheaper to do them by hand.

There are more manufacturing processes in this class than might be thought. The illustrations in this and some other articles in this issue show a number of them. Here is a shop building bus-bodies. Most of the work is cutting, drilling, fitting in place. Obviously the tool must be

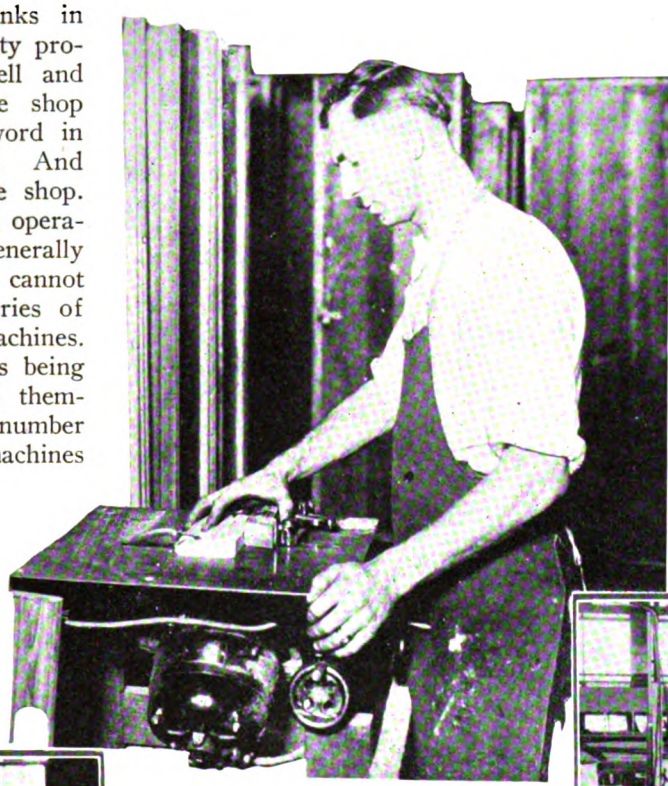


Fig. 1. Bench saw cutting a compound angle. Note the tilted position of the motor which drives the saw. The table remains level.



Fig 2. Above: A six-inch jointer for general utility work is mounted on a plank with handles which may be carried to work anywhere within range of a light socket.

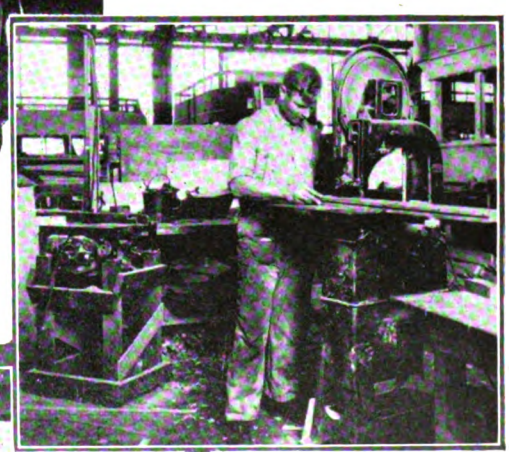


Fig. 3. Movable band-saw which may be rolled to any convenient position near the work it is to do.

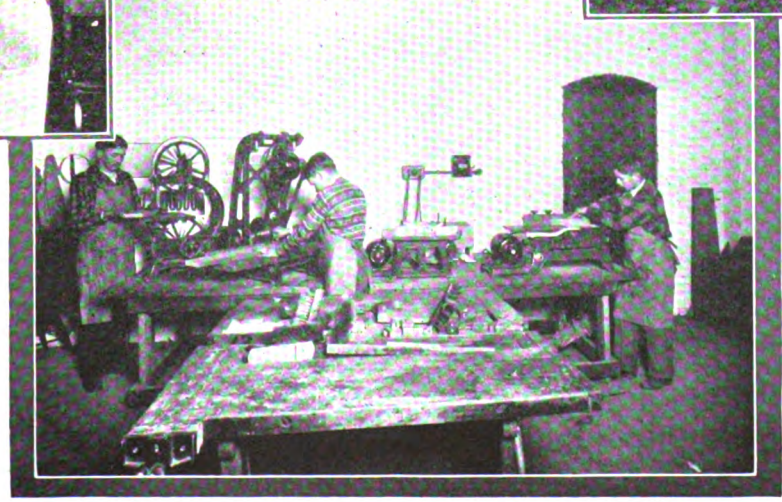


Fig. 4. A group of portable wood-working machines any one of which can be carried by hand to a new location. The group includes a band-saw, swing-saw, rip-saw and jointer.

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Fig. 6. Compare the speed of cutting of this portable saw with the hand method of trimming a group of 4x4's. It is about twenty times as fast.



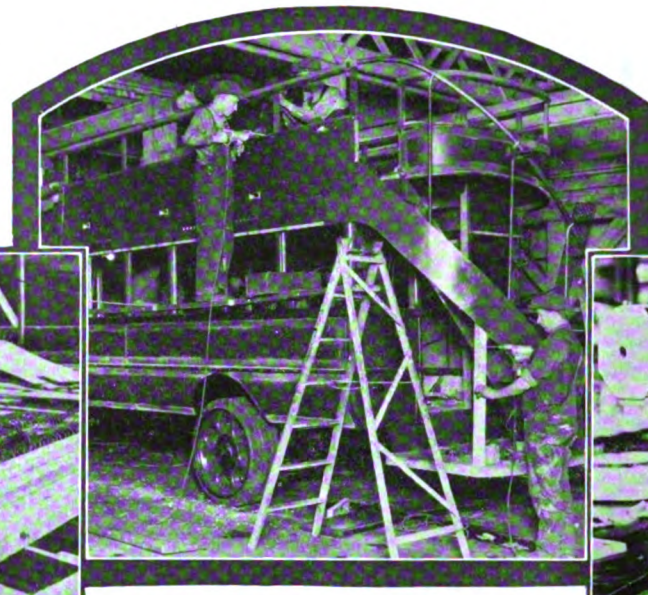


Fig. 5. This is the type of use for which portable drills are eminently suitable.

Fig. 7. Sometimes it is easier to mount the part to be drilled on a movable bench so that it can be turned and shifted readily to facilitate the use of the tools.



brought to the job. You can't put the lumber and sheets in one end of a machine and have a bus-body emerge at the other.

Then there are large castings, sheet-metal and plate jobs which must be completed on the same cut-and-fit plan. Blower casings, housings of one kind or another, piano metal-parts, machine pedestals and frames and others which cannot economically be handled through machines large enough to accommodate them are in the same class.

Another type of operation of the same nature includes wood-working processes, particularly those in plants where the quantity turned out is insufficient to warrant a heavy expenditure for fixed machines.

This is where the semi-portable, self-contained machines of the bench type, shine. They fill the gap between hand and light portable-tool jobs and heavy-quantity machine production. They can be set up anywhere on a wood bench, or they come already mounted on light roller-stands. They can be brought to the most convenient location near the work and moved out of the way when necessary. They are more powerful than the portable tools (which serve a different field of operation) and are quite equal to the work of the lighter fixed tools. As they are complete in themselves with motor, switches and speed regulators, they can be supplied with power with little expense and no waste, wherever they are placed.

Manufacturers of machine tools for working wood and metal have recognized the middle ground in mechanical processing which bench-tools occupy and are producing models as carefully designed and built as their

Fig. 8. Right. A semi-portable saw-table with tilting top. It is self-contained and is light enough to be moved about.

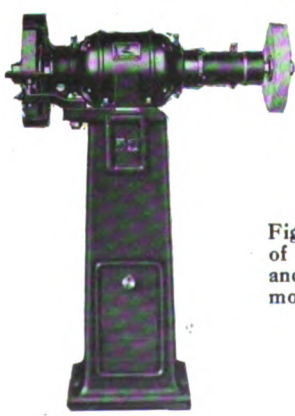




Fig. 9. Left. A light form of motor driven grinder and buffer which may be mounted on a dolly and used anywhere.

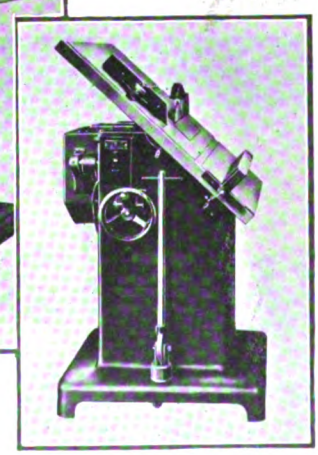


Fig. 11. Right. This stoutly built grinder is designed purely for bench use.



Fig. 10. Left. Another application of the motor-driven portable drill for use as a post-drill for a machine or carpenter shop.



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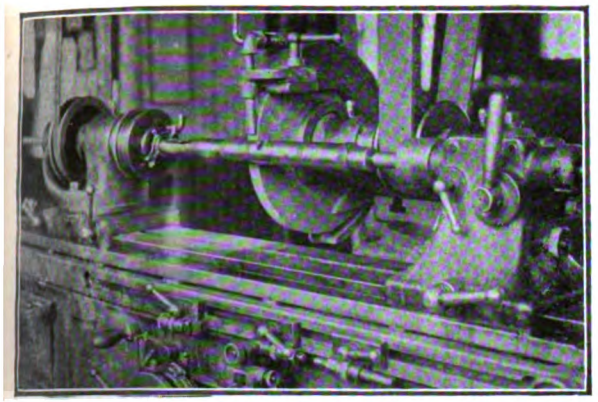


Fig. 12. This and the other cuts on this page illustrate the correct methods of grinding spindles, drills and reamers.

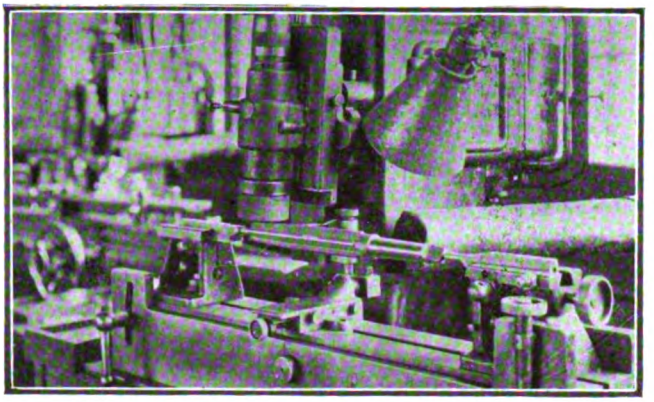


Fig. 13. Grinding the face of a taper reamer.

heavier prototypes, permanently placed machine tools.

For instance, one machine tool company has developed a junior bench lathe for light turning that is as flexible and able as the larger models. The machine is a three-step cone, single back-gear, quick change gear lathe. It is complete in every detail and contains all accessories necessary to do the work of a large lathe, except that range is more limited. It is made in 9 and 11-inch swing. A feature of this new engine lathe is that the tool, jig, and fixture equipment is interchangeable. The limit of error allowed throughout the construction of these lathes is .001 inch. Where a large engine lathe necessitated special equipment and considerable space, this new machine may now be substituted, and may be mounted on any bench or stand strong enough to form a solid base.

Another firm making a line of pipe-threading and cutting machines of capacities sufficient to take anything from a 6 in. to a 16 in. pipe, has gone into the manufacture of bench machines to an exceptionally thorough degree. One of their principal products in this class is a self-contained, motor-driven machine, suitable for use on any threading and cutting job which can be done in the field. It is especially useful in plumbers' and fitters' shops, where the work was formerly done by hand; in shipyards, refineries and on construction jobs. It finds extensive use in shops where pipe-fitting is an essential, if minor, operation in the process, as in the assembly of gasoline motors or other machines having internal pipe

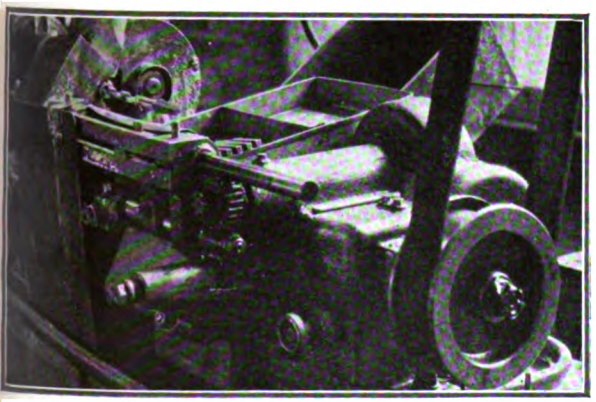


Fig. 14. A drill chucked ready for the final grinding cut.

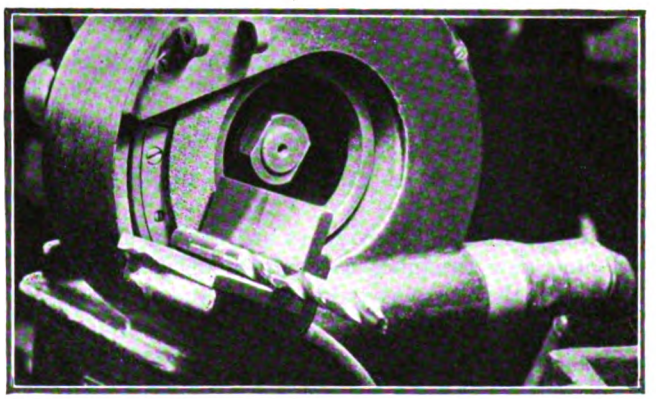


Fig. 15. Method of grinding the end of a drill shank using a face grinding wheel and a magnetic angle-chuck.

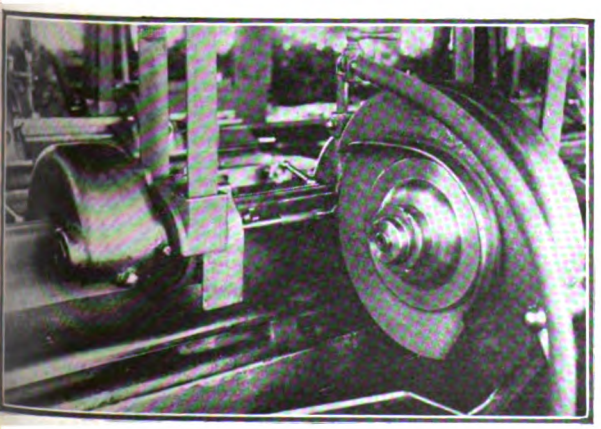


Fig. 16. Grinding the cutting edge of a short-length reamer. The wheel is drawn back to show the work.

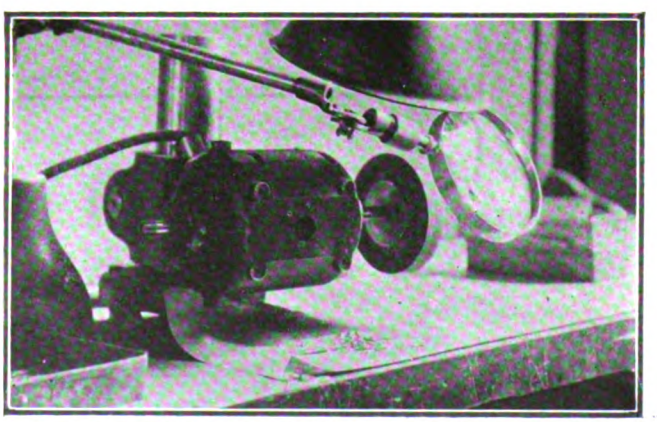


Fig. 17. When grinding small drills, held by hand, on this bench grinder, a magnifying glass is a great convenience.

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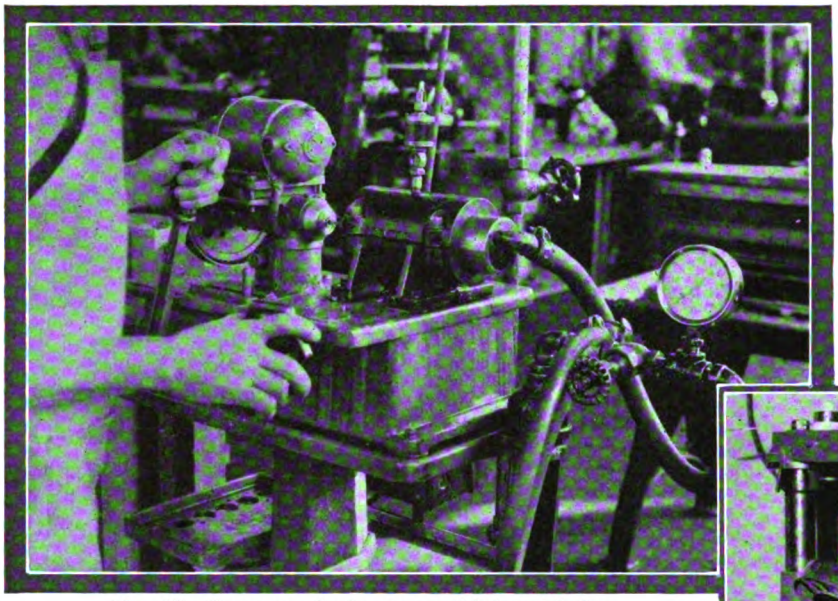


Fig. 18. Compressed air motor driving grinder to finish the bore of a small gear held in the chuck at the left.

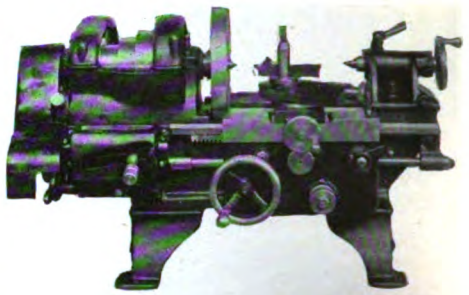


Fig. 19. Bench lathes are made to do heavy-duty in sizes as large as 9 and 11 inch swing. They are equal to the work of an engine lathe of the same size.

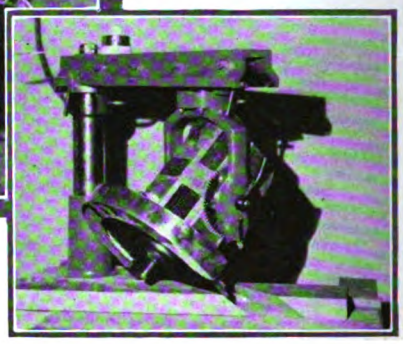


Fig. 20. Left. Post suspension, swivel-head, motor-driven wood-saw cutting a compound mitre.

connections as for forced lubrication systems.

They even make an electrically driven machine which can be held in the hand by the workman while threading a pipe in place. This machine has extraordinary flexibility. It can be used anywhere, in any position. Its value will be appreciated by anyone who has ever had to dismantle a whole machine to remove some part which needed rethreading. It answers the question of many an exasperated master-mechanic as he curses the job of getting out a hold-down bolt buried in concrete, which only needs a new thread: "Why doesn't Somebody invent a machine you could slip right over that thing and cut a thread on it?" Where there is no room for the arms of a hand-threader there is often ample room for the one described.

The makers of bench grinders are well in the lead in developing new machines to perform operations to recondition tools, formerly done only in a completely equipped tool-room. One of them makes a 10″ x 24″ grinder for grinding machine spindles, which is light enough to be classed with bench tools.

Their reamer-relieving machine was designed for clearing or sharpening reamers and mills. A drill-clearing machine was designed for clearing twist drills by grinding. For finishing the ends of tools, they are advocating their face-grinding machine. For facing for the shank end of a twist drill, they have developed another face-grinding machine. The company also manufactures an electric grinder fitted for grinding points of small size twist drills, and a plain grinder for counterboring.

Another company has designed a number of grinding machines for special usage. They have one universal tool grinding machine which saves many dollars in labor for the average contractor who has to keep tools sharp on the construction job. Their universal cutter and reamer grinding machine is of particular interest to the machinist, since it can be used for almost any type of tool. For internal grinding they have still another machine.

Another tool company has developed a post-bracket drill-stand for heavy duty, continuous or intermittent drill-work. An illustration shows the post stand and

(*Continued on page 94*)

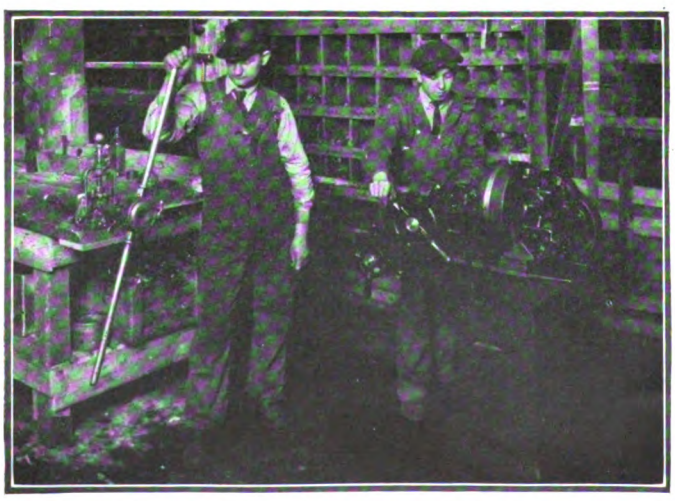


Fig. 21. At the left of the photo a tight-gripping pipe-vise and at the right a belt-driven pipe threader.



Fig. 22. This motor driven pipe threader for the small pipe-shop is so simple that an inexperienced fitter can operate it.

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Why "BD" and "CD" are the outstanding direct-current motors



Simplicity and Strength—

Magnet frames of BD motors employ special sheet steel laminations riveted between malleable iron end frames, insuring strength and rigidity with low weight per horse power. Cast steel magnet frames on "CD" motors have uniform yoke section—inner surface machined—no pockets or recesses.

Type CD motor armature coils are of the pulled-out, double-involute type, avoiding cross-overs of conductors in coils or to commutator, and providing ample fan effect for directive ventilation.



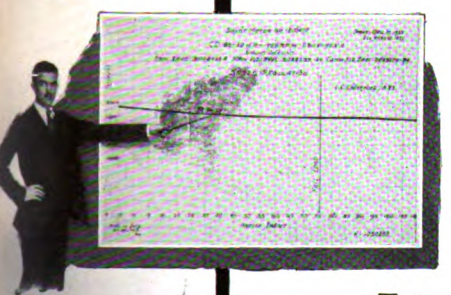
Excellent Commutation—

Obtained by specially designed commutating poles, careful proportioning of field and commutating windings, and other refinements in commutator and brush-rigging construction.



Exceptional Insulation—

Every precaution is taken to insure effective electrical and mechanical protection through the liberal use of mica, horn fibre, special varnish-treated fabrics, thoroughly impregnated armatures, and vacuum-treated field coils.



Uniform Speed—

Windings are designed and proportioned to insure positive speed stability throughout operating range. Field control allows 50 per cent speed increase over normal for shunt motors of 850 and 1150 r.p.m., 25 per cent speed increase for shunt wound motors of 1750 r.p.m. and for all compound wound motors.

Types BD and CD direct-current motors are available for constant speed or adjustable speed—in horizontal or vertical frames—equipped with sleeve or ball bearings—and arranged for various degrees of enclosure.

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½ to 3-h.p., two poles

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TYPE

CD

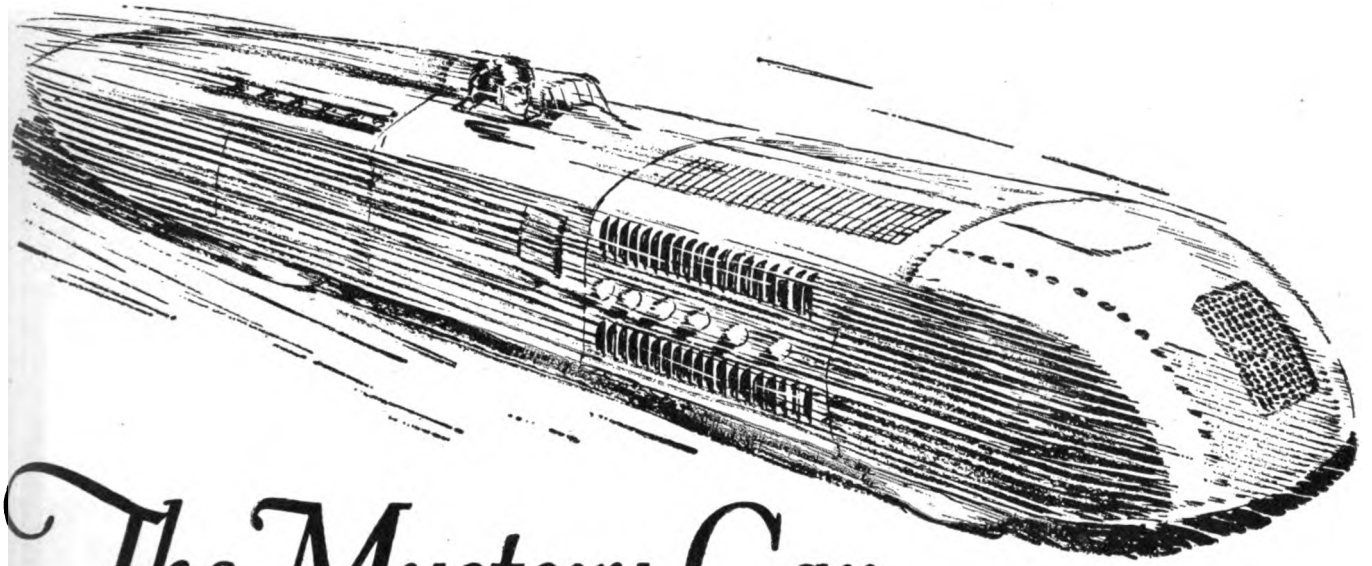
3 to 200-h.p., four poles



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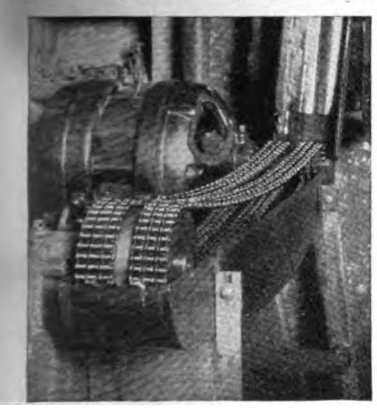
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—*Scientific American*

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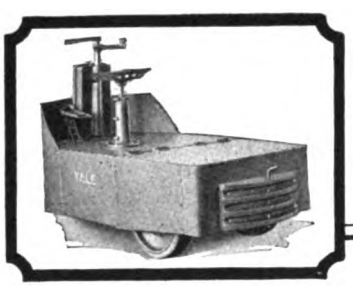
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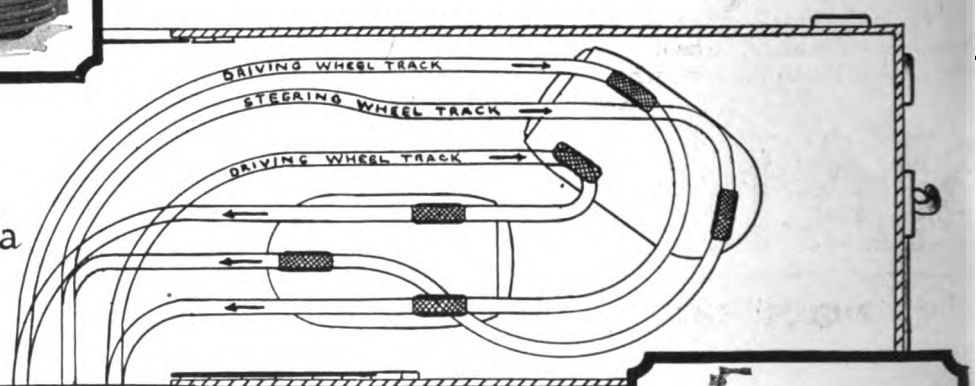
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YALE K24 Tractors with the Short-turning Radius



They pull heavy loads easily—and they have all the speed required—But Yale K24 Tractor Trucks do more than that—they turn around in the shortest possible radius.



This is a diagram of floor space of a Freight Car about 9×40 Feet



In the diagram shown above the dimensions of this standard freight car are 8 ft. 9⅛ in. by 40 ft. 6⅜ in. The arrows indicate an actual tracking circle covered in turning a Yale K24 Tractor inside the car. The Yale K24 Tractor not only enters easily—but does its work inside easily—going in and out without backing, and covering less ground than you ever supposed a truck possibly could. Not only is this possible with freight cars but in all narrow aisle spaces where tractors would ordinarily have difficulty in turning.

The above reason is one of many why you should investigate Yale Tractors for your needs. They handle normal and over-load conditions on a 25% smaller battery capacity and lower power consumption per ton-mile than any other truck of similar rating.

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Cost-Cutting Applications of Portable Tools

The Work Remains Fixed While the Tool Is Brought to It

By Reginald Gordon

THERE is a wide variety of application of portable tools for drilling, grinding, facing and sanding, as well as for rotary files, abrasive pencils and polishers and similar uses. They can be easily taken to any part of the shop and connected to a compressed air outlet, line-shaft, or electric outlet, according to the kind of motor embodied in the tool. The machine is thus brought to the work, while more than one operation may be performed simultaneously, thus in-

general speeding-up of the work throughout the shop.

The illustrations accompanying this article show some of the situations in which these little tools may be employed to great advantage. The chuck holding the tool must of course be driven at high speed and since both electricity and compressed air are available in practically every shop, the choice of a tool is usually made on other considerations than that of the kind of power used. Motors are always made to operate on either a. c. or d. c.



Photo Van Anda

Fig. 1. There is no limit to the territory of portable tools especially if you can bring your power plant with you as in this pavement cutting rig.

olving a minimum amount of moving or handling of the roduct. This is particularly important if the units are eavy, or bulky. Even with small pieces moved by conyor, portable tools are in many cases applicable. There no set-up required, as in the case of securing the part be worked on in a stationary machine. The portable ill or grinder does its work and is moved to the next ece. The outstanding advantages of such tools are rtability, convenience, saving of time in moving the rts and making machine set-ups with the result of a

circuits and their armature shafts are mounted in ball bearings. For drills of ⅞ inch size, they weigh about twenty-five pounds; the smaller sizes correspondingly less.

When the work to be done is not very heavy or continuous, a convenient outfit has lately been placed on the market which is neatly packed in a steel carrying case, put in an automobile or taken into a railroad car. All the necessary equipment is put in its proper place in the case and can be kept there permanently, so that there

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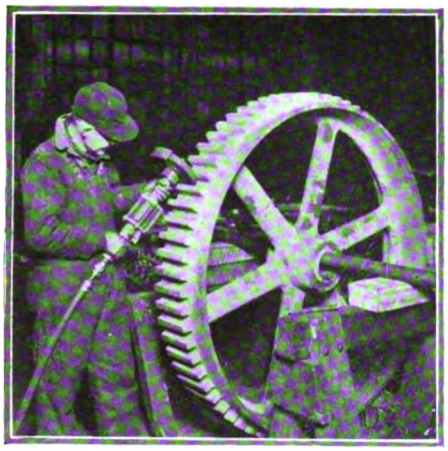


Fig. 2. It would be quite a job to set this gear up in a machine to be ground. The portable grinder simplifies the operation.



Fig. 3. This is a compact screwdriver gun fitted to run on 180 cycle alternating current supplied by a small converter utilizing standard-cycle power.



Fig. 4. Compressed air type of rotary tool used for grinding piano plates.

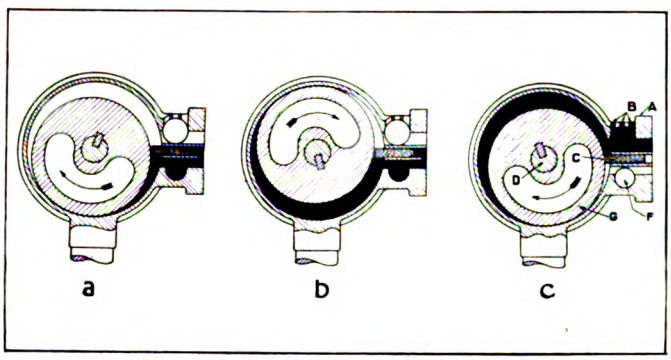


Fig. 5. Diagram showing the operating principle of portable air motors. (a) Air (black) entering intake port and starting rotor on its cycle (b) Cycle half completed; rotor on upward power stroke. (c) Cycle completed; air leaving exhaust ports.

is little chance of anything being mislaid or lost. For odd jobs, emergency repairs, etc., it has proven very useful.

Compressed air plays such an important part in shop work that a new grinder and sander, which is shown doing a variety of work, will be of interest to many plant managers. The motor of this new machine has two cylinders, each having an eccentric rotor, and as may be seen from one of the illustrations, since the rotors are keyed to the shaft in opposite positions, one rotor is taking in air at the same time that the other exhausts it, thereby giving two power impulses at each revolution of the shaft. The speed of the rotor is 4,700 r.p.m. and with a 9-inch disc pad, its weight is 11 pounds. There are only three moving parts to the motor which of course runs on ball bearings. When used with an abrasive wheel, this tool is adopted to a wide variety of work, such as grinding off high spots between the teeth of cast gears, grinding piano plates, cleaning scale from structural steel, and any other operation of a like nature.

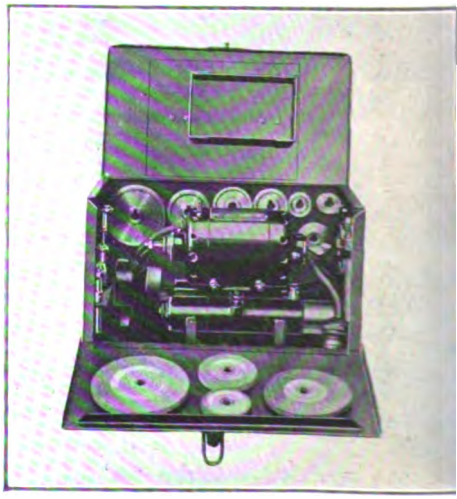
Another class of semi-portable machines is mounted on pedestals, or on a rolling floor stand and transmits power to the tool through a flexible shaft. One such tool is being built in three sizes, operated at ¼, ⅓ and ½ hp. respectively. The stand has a universal swivel, allowing the motor to be moved in any direction. The shaft receives its power from the motor through a leather belt, connecting two sets of step pulleys, by means of an eccentric axis. The distance between the two may be regulated and the speed correspondingly controlled. Grinding wheels, sanding drums, wire brushes, burrs, rotary files and mills may all be operated from the ball bearing handpiece.

In the design of portable electric tools, one of the difficulties to be overcome is the reduction of weight and bulk consistent with the necessary torque at the chuck. The speed of the driving motor must be from 450 to 750 r.p.m. One of the tools recently developed has been equipped with a motor adapted to high frequency alternating current at 180 cycles per second. As 60 cycles is



Fig. 6. Left. Portable electric tool mounted on head of boring mill to grind armature-core blanking die.

Fig. 7. Right. Complete grinding units come packed in a case, which can be taken anywhere like a suit-case.



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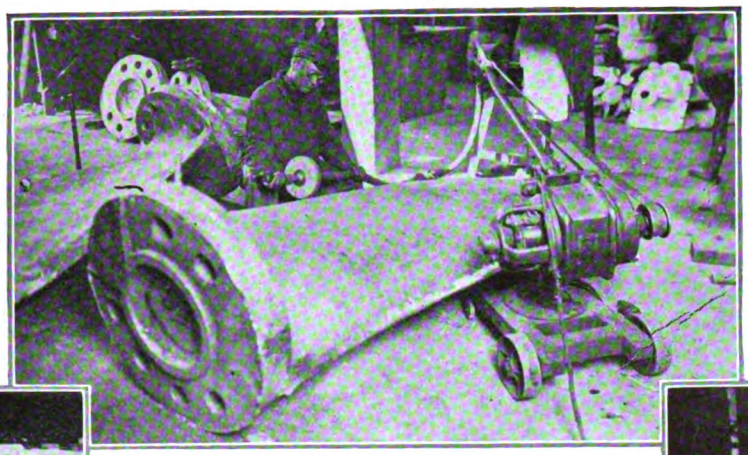


Fig. 8. Right. The flexible-shaft, portable tools are particularly useful in the cleaning room, where casting fins may be ground off and rough spots made smooth.

Fig. 10. Below. Flexible shaft screw-drivers belted from a line-shaft, making up box-shooks in a shipping room.



Fig. 9. An electric tool countersinking a heavy machine frame.

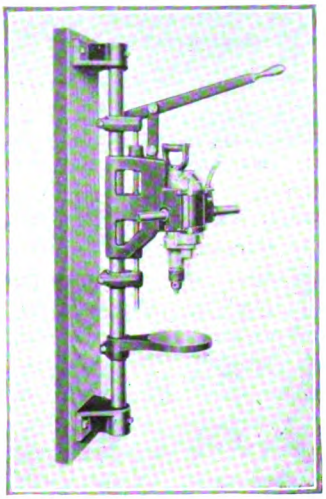
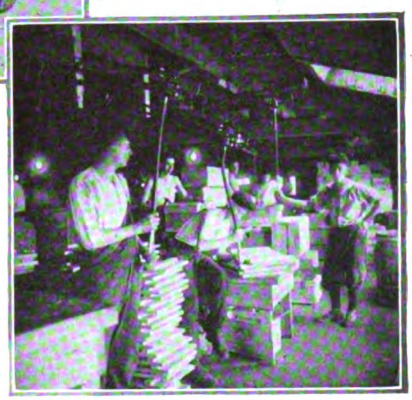


Fig. 11. Left. Portable electric drills may be mounted as post-drills to work on wood or metal.



standard commercial frequency, some form of frequency changing machine must be used to supply energy to the tools of this class. An a. c. machine, operating on a standard 60 cycle circuit, generates 180 cycle energy for this purpose. With this frequency, a squirrel-cage motor of compact size can be used which develops a speed of 10,500 r. p. m., thus securing a lighter, more easily handled tool for the same output of work; or compared with a tool of the same size using an ordinary motor, more power is obtained for drilling, grinding, etc.

In addition to thus securing more power per pound weight of the tool, the squirrel-cage motor operates without brushes or commutator, thus doing away with one source of trouble; in addition to which it runs at constant speed. The only windings of this machine are in the stator, the rotor having copper bars riveted in place and welded. Thus such tools give ample power at the work, give no commutator or brush trouble and run at constant speed, all of which conditions contribute to maximum output of the department of the factory in which they find appropriate application.

An interesting test was made of high cycle electric tools in an automobile manufacturing plant. Nut runners and screw drivers were operated in the test, with the following results:

High-frequency motor operating on 220-volt, 180 cycle, 3-phase current, at 10,800 r.p.m. Speed of the tool was 750 r.p.m.

The electric tool at full load took 3 amperes, equivalent to 1.44 kw. The cost of operation being 1¼ cents per kw. hr., gives as a result for nine hours' operation $0.162; or a difference in cost in favor of the electric tool of $1.698 a day over an older type.

The report of the test indicated that the electric tool, on these particular jobs, was more satisfactory than some other types, which, by the nature of their construction, produced an uneven tension on the nuts, as in testing trueness of tires on a special fixture built for the purpose. Some nuts had to be loosened and others tightened in order to true up the wheel to inspec-

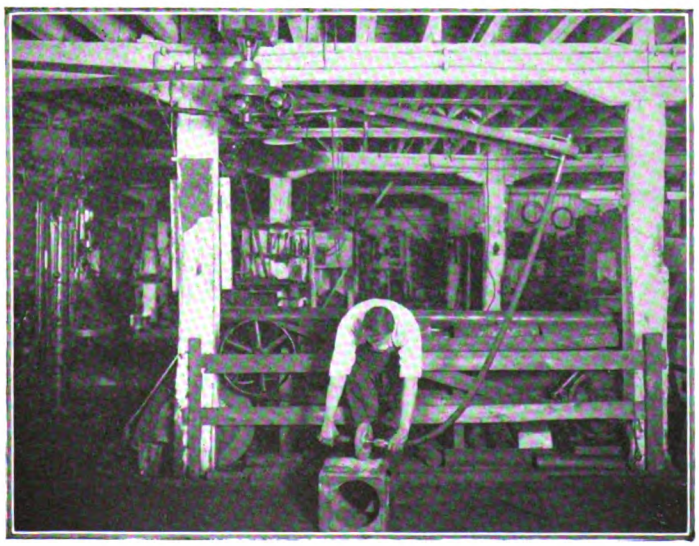


Fig. 12. This picture shows the belting and pulleys for driving a portable, flexible-shaft grinder.

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Fig. 13. Flexible shaft tools may be mounted on roller stands as in this car-body plant.



Fig. 14. Flexible shaft grinder with self-contained motor operated from the lighting circuit.



Fig. 15. Flexible shaft grinder with motor suspended overhead, permitting wide radius of use.

tion requirements. The electric tool, on the other hand, was equipped with a clutch that automatically released when a certain torque was attained on each nut. In either case, whichever kind of power was employed to drive the tool, the saving over hand labor, not to mention the time saved in getting the cars through the shop was a vital matter to the production department.

With portable electric tools, subjected as they usually are to rough usage, a commutator motor may at times give trouble. Commutators wear unevenly, brushes must be adjusted and at times replaced; but with regular inspection, these occasions should not be very frequent. Where high-frequency current is employed involving employment of a squirrel-cage motor, consideration must be given to the cost of an alternating current machine built to furnish energy at 180 cycles per second, and this factor must be weighed against the mechanical advantage gained in the high rotative speed of the chuck and consequent smaller bulk and lighter weight for the same effective power at the working tool.

With certain types of air tools, a very high speed can be attained, in some cases from 4,000 to 6,000 revolutions per minute, as they have a direct drive, without gears. For other purposes, also, they are built with reduction gears, so that the grinding tool may be adapted to any speed required.

Another application for portable tools is for pattern making, model making and a great variety of experimental work; operations that are not repetitive, yet where a powerful, convenient machine, capable of driving almost any kind of cutting or grinding tool is desirable at a low price and small power consumption.

The transfer of heavy pieces from floor to a fixed machine, the time taken to set the piece in

(*Continued on page 96*)

Fig. 16. Showing the universal use of the motor-driven flexible-shaft tool, mounted on roller-stand. It is here used in a vulcanizing shop.

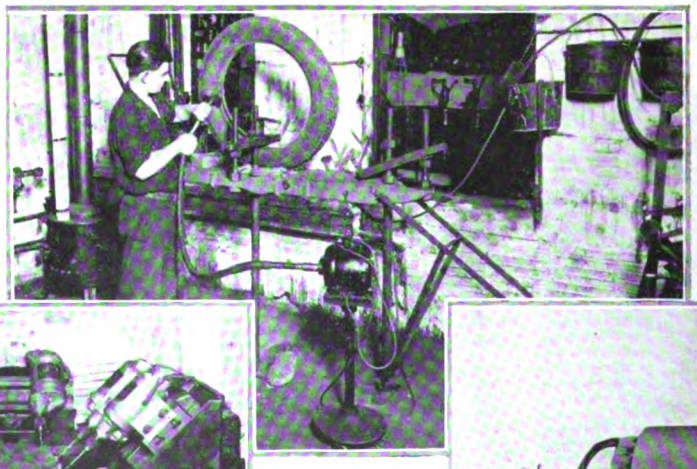
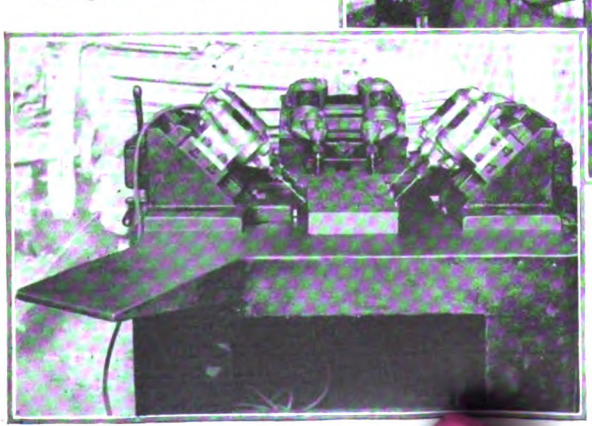


Fig. 17. An unusual setup of six portable drills that can drill 1,200 wood blocks per hour. The blocks are used for shipping automobiles. One switch controls all the motors and the slide heads are kept moving in unison by means of feed gears in the base.



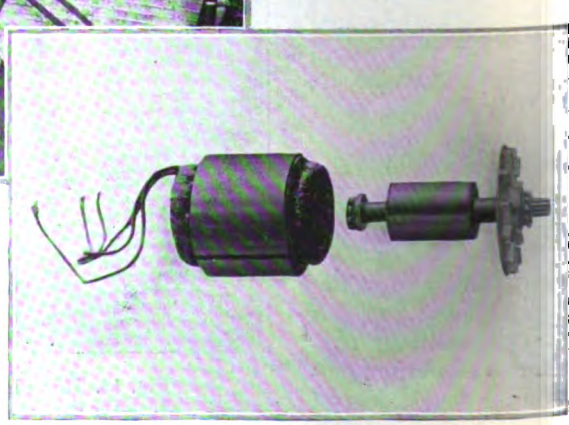


Fig. 18. Disassembly of a high-cycle motor for portable tools. The coils are in the ruggedly built stator and the induction bars in the armature.

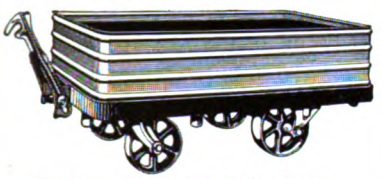
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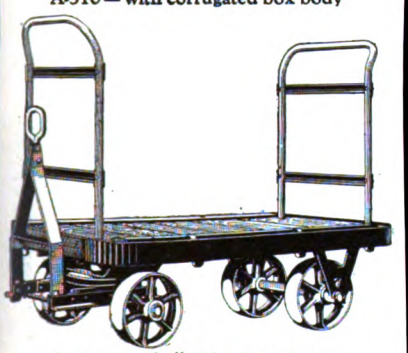
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A-310—all purpose "castor steer" trailer



A-310—with corrugated box body



A-610—with "fifth wheel" steer

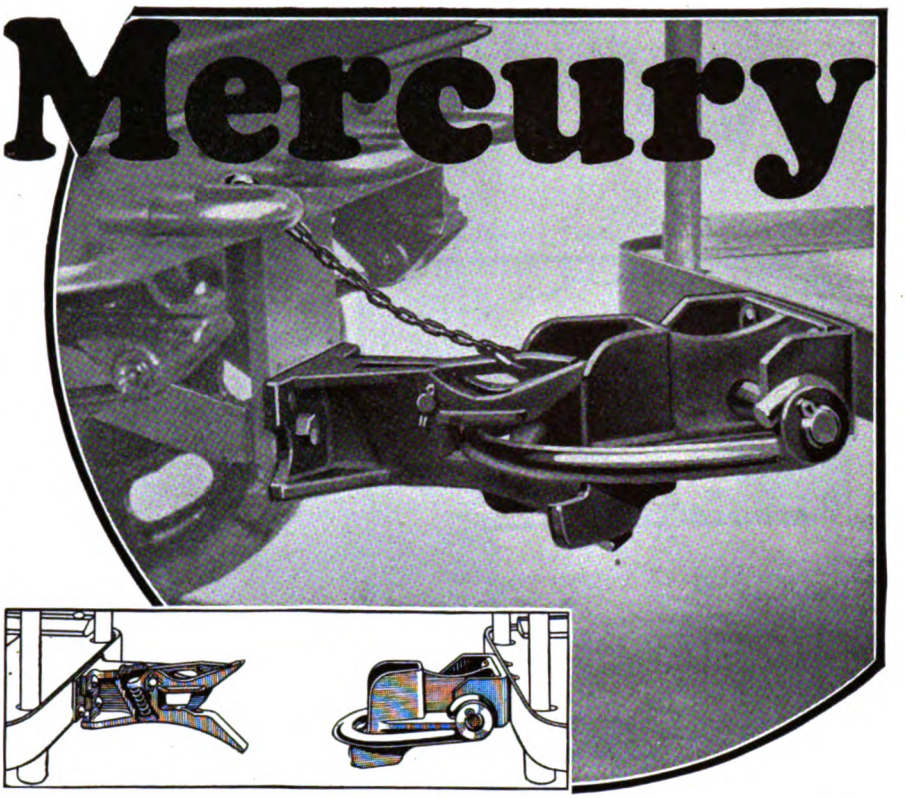


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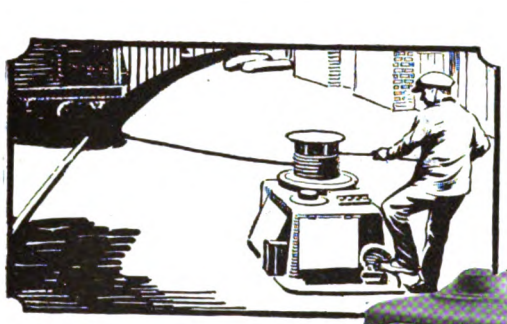
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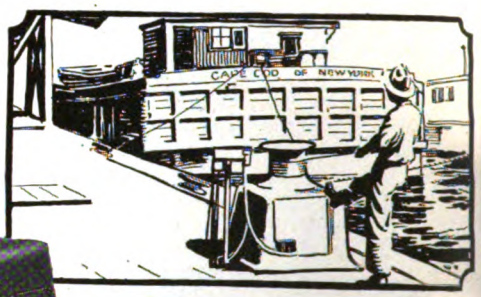
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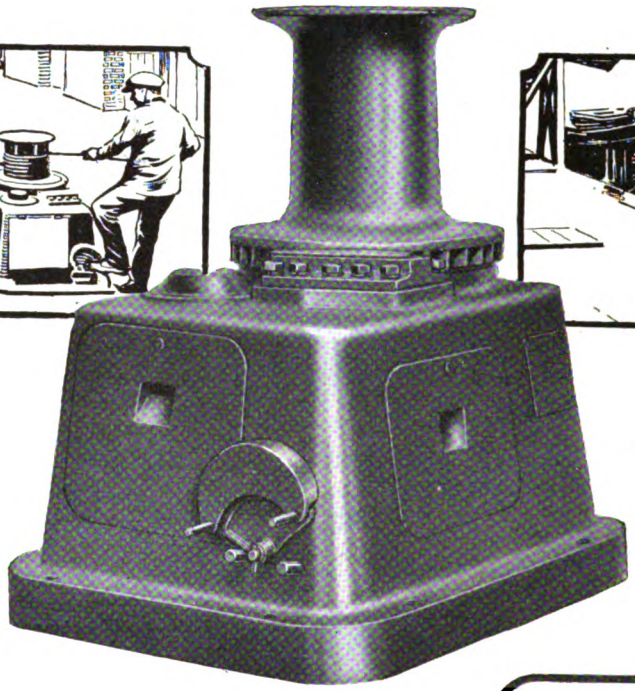
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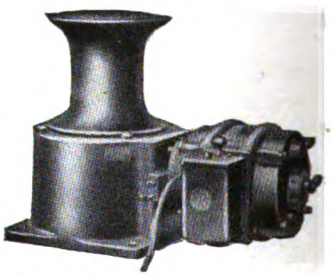
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Power Saving Applications of Small Motors

What One Must Know About Them to Apply Them Intelligently

By A. L. Brook

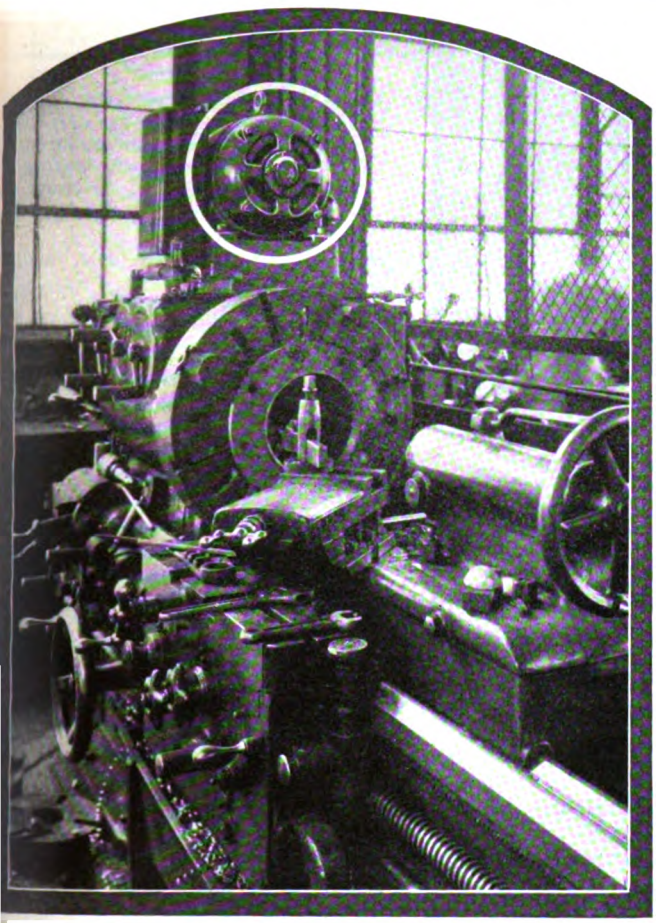


Fig. 1. Self-contained motor, starter and relays applied to a large-swing lathe.

TIME was when it was always the work which was taken to the machine tool, and not the tool to the work as is now sometimes possible. Then it was that the machine had to be securely bolted in a fixed position, for it had to be fed with power, and belts—with the occasional flexible shaft for the lightest sort of work—were the only means of giving it its life blood.

Now, however, all is changed. Thanks to the development of the small motor it pays, in many instances to let the tool do the moving about. A flexible conductor supplies the current not only in the small electric drill for hand use but is frequently used to feed motors, which are often mounted on a movable part of a machine tool. This latter sort of thing has come about from the present tendency of machine tool manufacturers to place the driving motor just as close to the cutter head or tool as is possible.

In woodworking, for example, the high speeds of motors match well with the high speed requirements of many of its operations. So here is an opportunity of linking the driving motor close to the cutting tool which it drives.

And in some metal-grinding operations, where even with the small wheels which are required, a sufficient peripheral speed is obtained by direct connection, because of the high rotating speeds possible with electric motors.

While the flexible cable conductor may be the ultimate in flexibility of power lead, the relative blessings of even fixed conduit carrying power to permanently located machine tools should not be forgotten; it was not so long ago that machine tools had to be located entirely with regard to the direction of the line shafting. That was the pivotal point about which a machine location problem revolved in those days. The best light conditions, proper routing and



Fig. 2. Standard, direct-current, adjustable-speed motor which may be obtained in the form shown or to suit the arrangement of the machine to be driven.

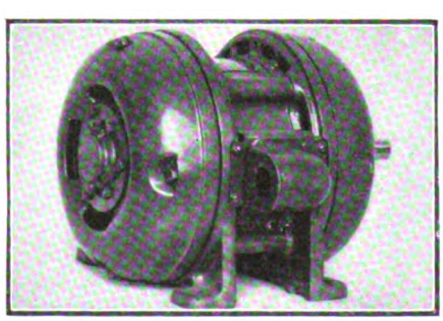


Fig. 3. Squirrel-cage induction motor, totally-enclosed and fan-cooled for use in dust-laden atmosphere.

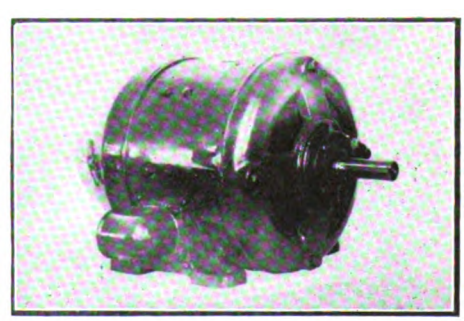


Fig. 4. Totally enclosed, fan-cooled direct current motor for use under the conditions of Fig. 3. There is no danger of commutator, armature or field break-downs.

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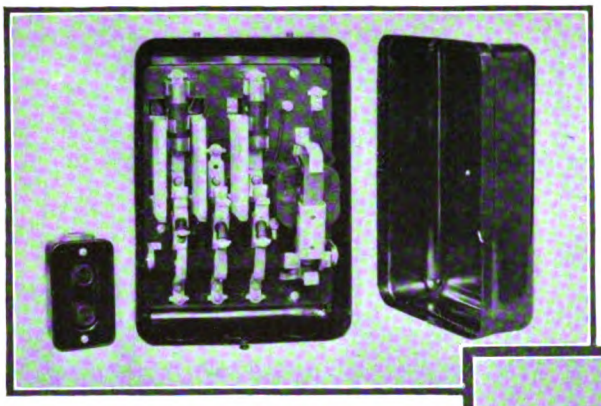


Fig. 5. Enclosed magnetic switch for across the line starting of squirrel-cage motors. It may be enclosed in the machine-tool and the case omitted, if desired.

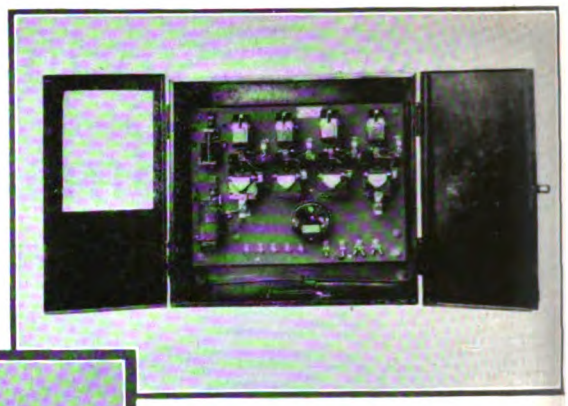


Fig. 6. This is a reversing, magnetic-control panel for use with adjustable speed, direct-current motors. It has dynamic breaking and thermal overload protection.

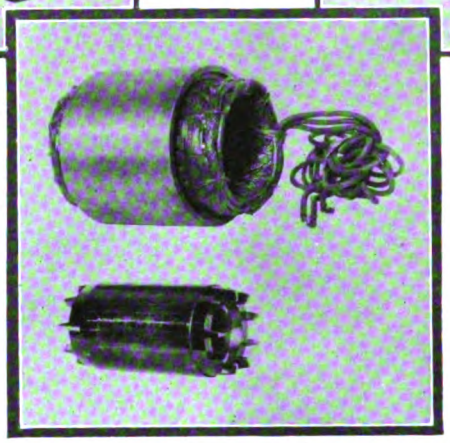


Fig. 7. The rotor and stator of squirrel-cage motors can be built to meet any reasonable space limitations. Here is one for use where space is at a premium.

so on now are the controlling factors, as they should be.

While the tendency toward greater and greater motor application has been dictated partly by the necessity for increased production efficiency, it has also been hastened by the desire to improve working conditions and the safety of the employees. The absence of a forest of belts in a large workroom naturally leads to better lighting. At the same time many sources of accident are eliminated. In fact it even occurs, sometimes, that the cost of an adequate set of belt guards exceeds the cost of a motor to drive the machine direct.

It should not be assumed, however, that the efficient use of motors necessarily means that each machine should have its own. A whole group of machines may be best driven by a single motor. While this question: "when a unit drive and when a group drive" is a whole subject in itself, it is generally true that the heavier machine tools or those having irregular demands for power are best driven by individual motor. And the relatively light machines which are doing work calling for uniform amounts of power drive well in groups. But there are so many combinations of conditions possible that no one rule may be given, nor is it within the scope of this paper to do so.

The tendency toward the ever increasing use of motors in industry has called for a greater flexibility of motor characteristics. Then, too, motor bearings are better—vastly better—than they used to be, particularly as regards their oiling systems. One manufacturing company, for example, employs on its motors large, self-aligning, broached phosphor-bronze bearings that are sealed against dirt, dust or grit and have a special non-hardening wick for the oil so that lubrication is required but once a year. Then ball and roller bearings have played a large part in cutting down both power and maintenance costs in connection with motor equipment.

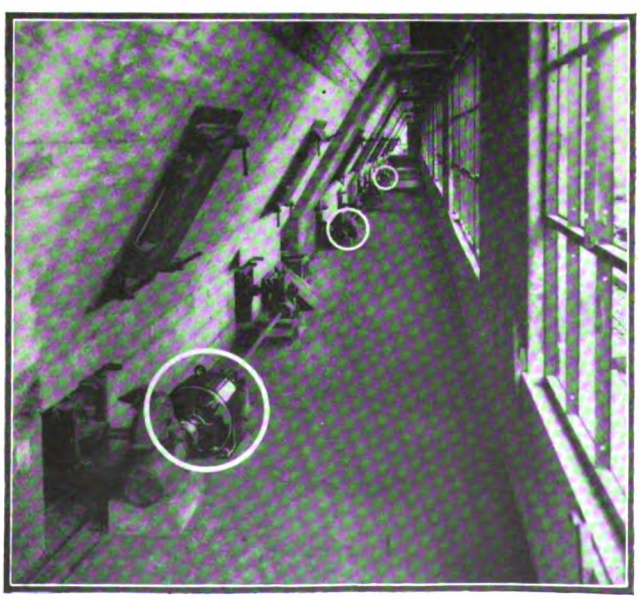


Fig. 8. Small motors driving a cement mill through a worm and wheel. Control remote or automatic.



Fig. 9. An automatic motor-driven, air-compressor unit which maintains the pre-determined pressure without further attention.

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A booklet containing complete information regarding this contest can be secured from The American Society of Mechanical Engineers who will judge the papers. Address them at 29 West 39th St., New York City, or write direct to The Lincoln Electric Company, Cleveland, Ohio.

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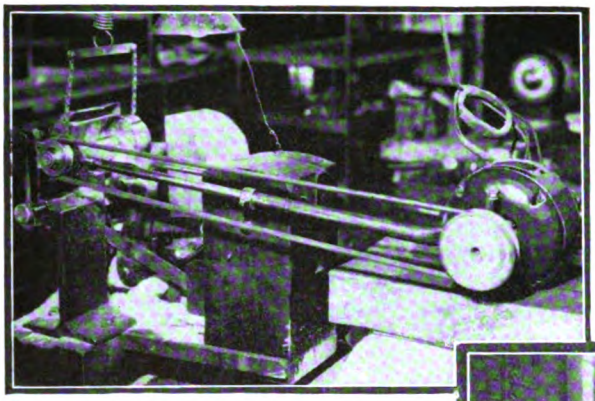


Fig. 10. A convenient arrangement of a small motor driving light, bench-type, wood-working machinery.

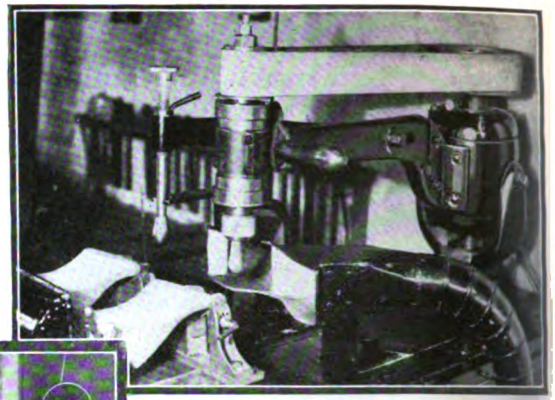


Fig. 11. Free-swinging, vertical motor driving wood-cutter by means of a belt.



Fig. 12. The drill is mounted directly on the motor shaft in this wood-working bench tool.

The motor manufacturer has also brought to the industrial executive a number of other improvements of large importance. He has, for instance, produced interchangeable motor frames. This in itself has played a large part in the development of the motor drive.

Another distinct stride is the building of motors of different types which are interchangeable in base mounting dimensions. This is a very desirable feature not only to the manufacturers of electrically driven equipment but also to industrial plants which are called upon to make frequent changes in their arrangements to accommodate production demands.

Still another move helpful to those who would adopt the motor drive is the practise of the electrical manufacturer of supplying the machine tool maker with only the rotor and stator so that the machine manufacturer may design his housing to conform to the rest of his machine design.

These and many other improvements in the design and construction of electric motors have demanded the close coöperation of plant engineers and machine tool makers with the engineers of the motor manufacturers, but the results in every case have been profitable to the user.

That tool breakage is reduced under motor drive conditions is another advantage to the user. This is readily accomplished by a relay device which will shut down the motor when undue overloads are subjected to it. In fact, the entire subject of motor control is receiving more and more attention. Magnetic control, for example, is frequently mounted within receptacles provided as part of the machine design.

It is pretty generally recognized that to select the proper motor for a given job is vastly important but sometimes it is even more essential to the ultimate suc-

(*Continued on page* 100)

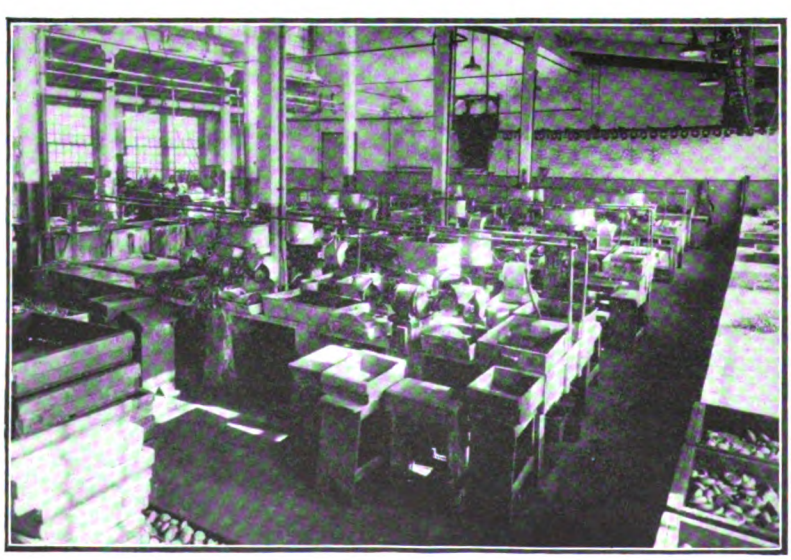
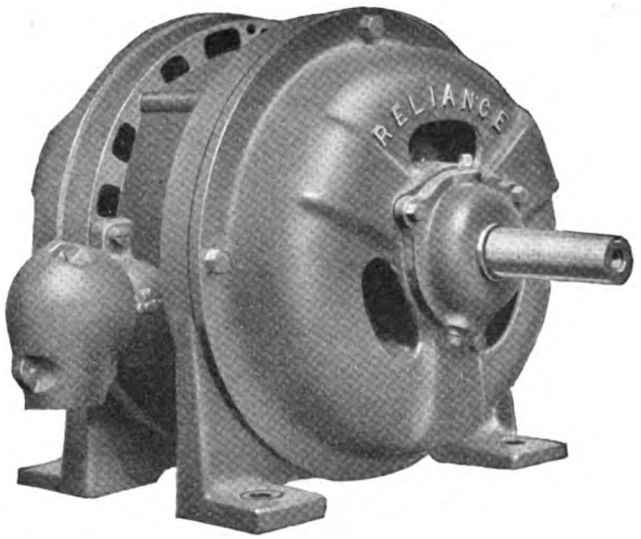


Fig. 13. Small motors can be handily used for bench polishing and buffing, the wheels being mounted directly on the motor shafts.



Fig. 14. A well-known form of enclosed motor driving a double grinder-stand, under exceptionally severe dust conditions.

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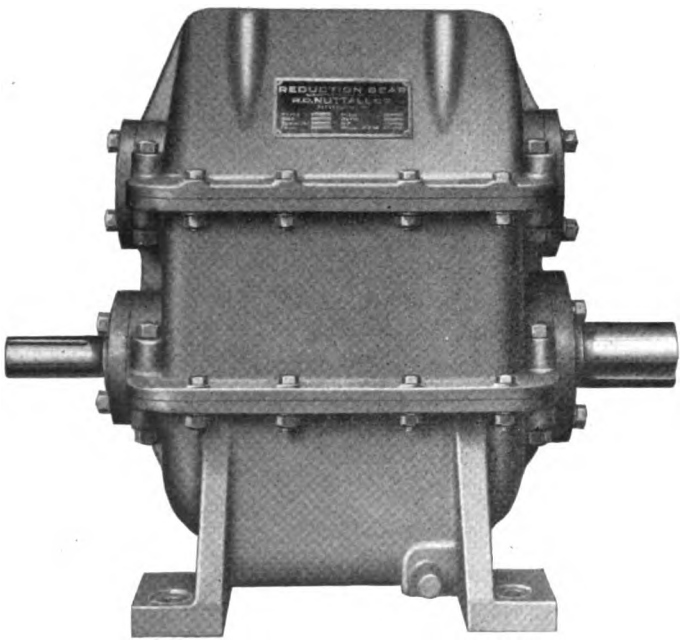
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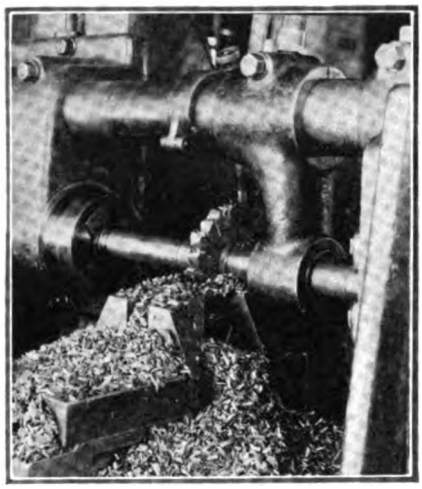
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Fig. 1. Left. Heavy duty cutters, as those of a railroad repair shop, require frequent inspection and conditioning.

Fig. 2. Below. A cutter of this type, also on heavy-duty work will give an excellent account of itself if it receives reasonable care.



How to Lengthen the Life of Cutters

t Depends on the Grade of Cutter, Speed, Material, Lubrication and Rate of Production Desired

By C. A. Fulton

HOW can the serviceable life of cutters be lengthened? It is one of those perfectly natural and legitimate questions which is anything but simple answer. But it has been answered by many users d the reputable manufacturers of this type of tool are ly too glad to coöperate with their customers and proscts toward this desirable end.

The admonition most frequently heard is, "Keep your tter sharp." That of course seems obvious, but it is not easy to accomplish with economy. It is a well known fact that a cutter will work beautifully for a long time and then without apparent warning the edge breaks down with the result that the work is spoiled, the tool seriously, if not irreparably, damaged, and production is delayed.

A good machinist can tell by the feel of the machine, the appearance of the tool and the appearance of the work when this is about to occur. But he should not

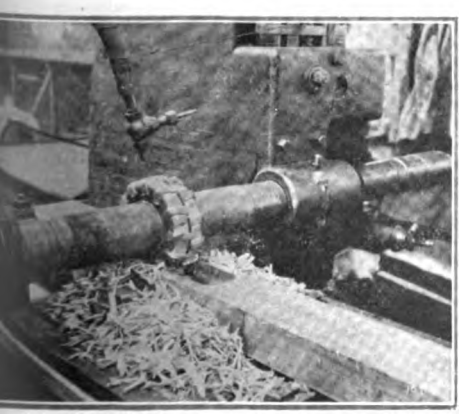
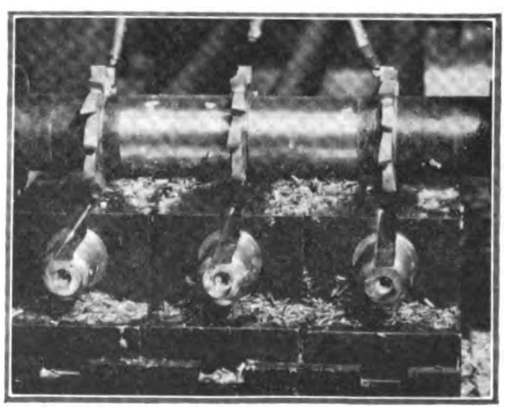


Fig. 3. Left. Cutting a channel in a locomotive side-rod. Try this job with a low-grade cutter if money is no object.

Fig. 4. Right. Staggered tooth side milling cutters cutting keyways in chrome-nickel steel axe-shafts. Production increased two hundred per cent.



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Fig. 6. The insert blades of this reamer are held in place by friction. Adjusted by shimming and grinding to diameter.

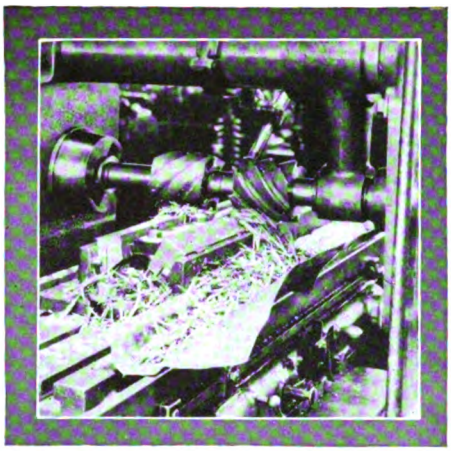


Fig. 5. These helical cutters replaced plain milling cutters. Result: Feed, speed and production doubled at lower cost.



Fig. 7. Gang cutters, including two opposed helical and two single side cutters, removing 25½ cu. ins. cast iron per minute. Cut one-eighth inch deep, table speed 16 inches.



Fig. 8. Insert blade multiple boring tool constructed as in Fig. 6. Vanadium steel body. Blades have bearing on sides and bottom of slots.

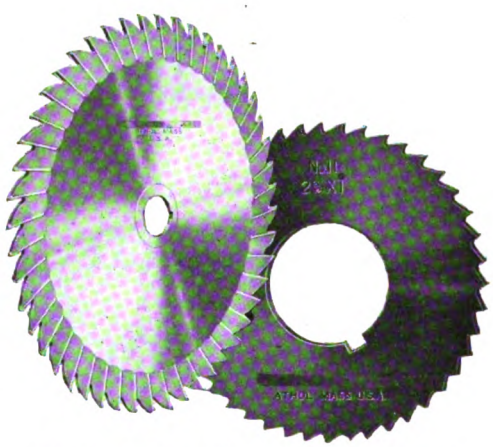


Fig. 9. At the left a metal-slitting saw with side teeth to avoid clogging and, at the right, a high-speed screw-slotting cutter for shallow cuts, both for high production work.

be depended upon in any well-regulated plant, running on a quantity production basis, for the operator may not be sufficiently experienced or his attention may be distracted by something else. The time to change tools is well before danger of this breakdown occurs. To know when this should be done can only be determined experimentally and even the human factor of watchful attendance cannot be entirely eliminated because unknown quantities are always liable to be present.

The different factors in any particular job which have an effect on the amount of cutting which a given tool can do before grinding becomes necessary are surprisingly numerous. There is the hardness of the metal to be cut, the nature of the cut, and design of the cutter, the speed of cutting and feed, the condition of the machine or spindle, the accuracy required, the lubricant, the method of sharpening, etc.

It is worth while to consider some of these briefly by themselves. The hardness of the metal to be cut should be as uniform as practicable where large numbers of similar pieces are to be turned out. Otherwise any standardized operating practice tending toward economical length of life for the cutters will be out of the question. Take drop forgings, for instance. If those at the bottom of the pile are thrown on a wet floor they will have cooled more quickly, and will consequently be harder, than those in the center of the pile which have cooled more gradually. The same will be true, to a lesser extent, perhaps, of those on top of the pile. Also unless care is taken with castings there will be serious variations in the hardness of the metal due to changing conditions of cooling. Even with steel trouble sometimes occurs due to impurities such as particles of slag. With a soft material such as brass the cutting speed is usually increased so that the net wear in a given time will approximate that with harder metals but the inherent properties of brass will bring in conditions of their own which must be considered.

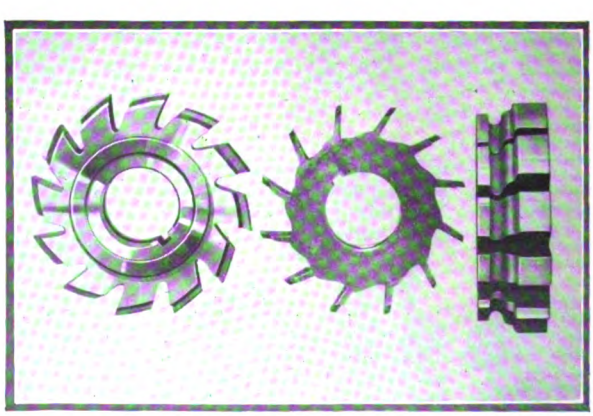


Fig. 10. A graphic picture of the amount of regrinding good cutters will stand. The new cutter at the left and the same cutter still in use, in the center.

Of all engineering operations which are a prey to variations in local conditions that of cutting metals is most vulnerable. The shape of the cut and the design of the cutter with relation to it are of the utmost importance. For instance some of the foremost makers of cutting tools are now making form cutters with rake teeth and spiral fluting so as to give a shearing rather than a chopping action. This

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Fig. 12. The cutting tool is only a small part in itself so that replacements are inexpensive.

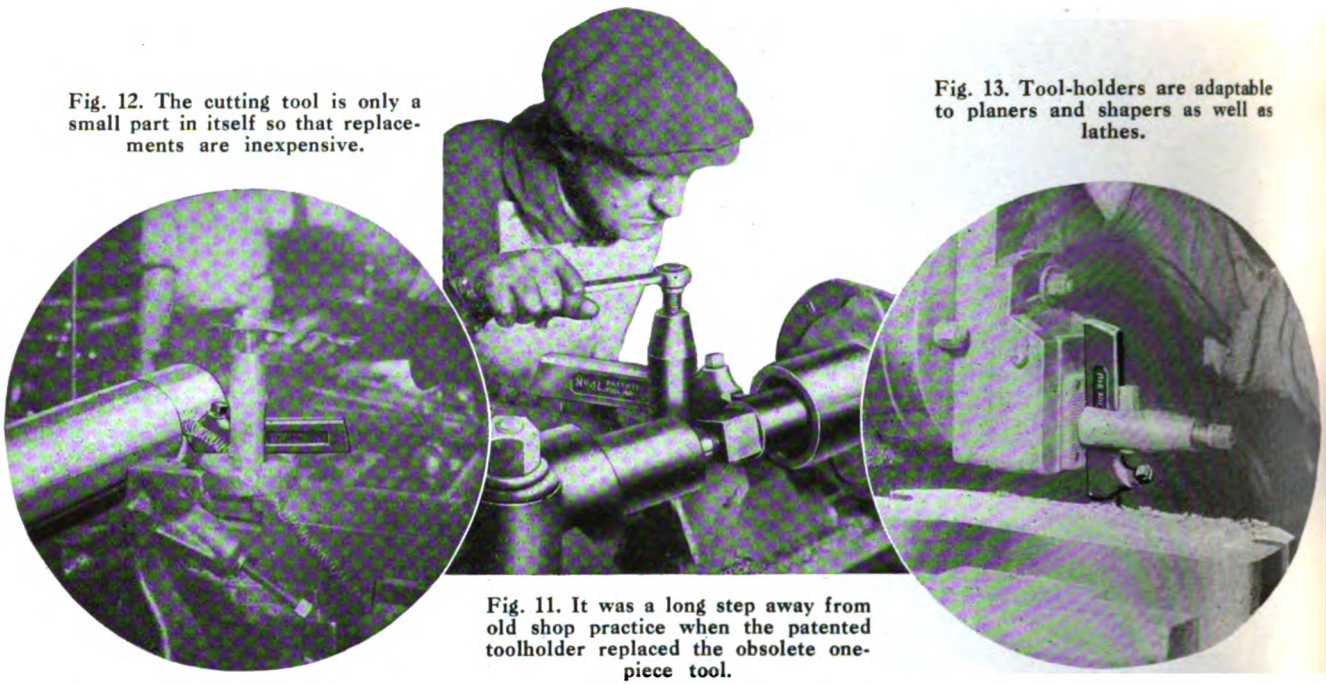


Fig. 13. Tool-holders are adaptable to planers and shapers as well as lathes.

Fig. 11. It was a long step away from old shop practice when the patented toolholder replaced the obsolete one-piece tool.

practically eliminates vibration and chattering and results not only in smoother surfaces but a greatly prolonged life of the cutter. To show what has been accomplished in this way the instance may be cited of a company which formerly milled 3,000 pieces with a straight cutter and then reground it. With a cutter of proper design having a shearing action it is only necessary to grind after 18,000 pieces have been milled. In another case where the conditions were different the production per grind was increased from 75 pieces with straight fluted cutters to 200 pieces with the more modern types of cutter.

Another very important detail in the design of the cutters which greatly reduces wear and breakage is that they should make a balanced cut, thus breaking up the chips. The way this is accomplished varies with different kinds of jobs. Cutting speeds must be right for the conditions presented by any given job. Sometimes a speed that is too slow is just as bad as one that is too fast. Furthermore, in determining the speed, the relation of the value of the cutter to the product must be taken into account, as it may be more economical to wear out a comparatively inexpensive tool in a short time in order to secure a high rate of production than to prolong the

(*Continued on page 98*)

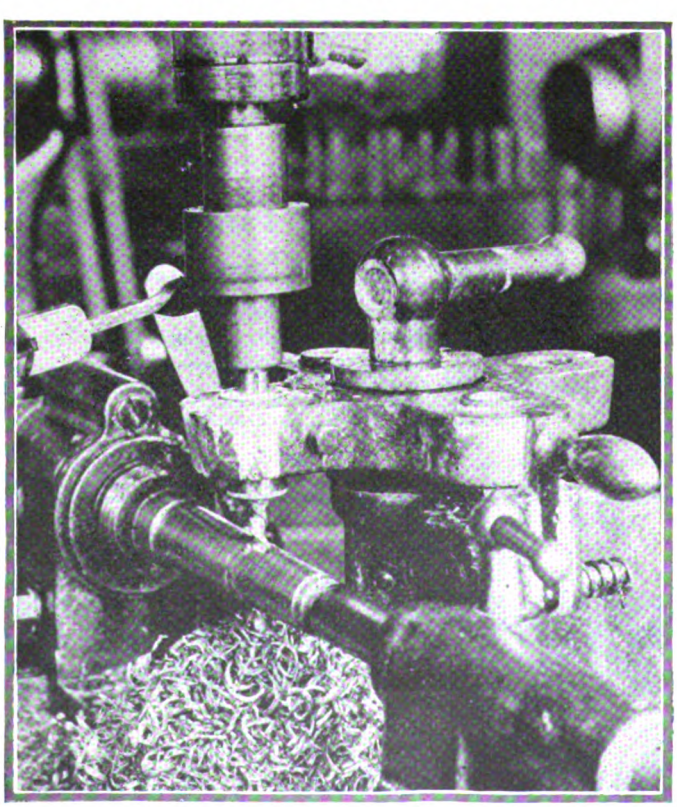


Fig. 14. High-duty drill with guide to eliminate spring and reduce breakage.

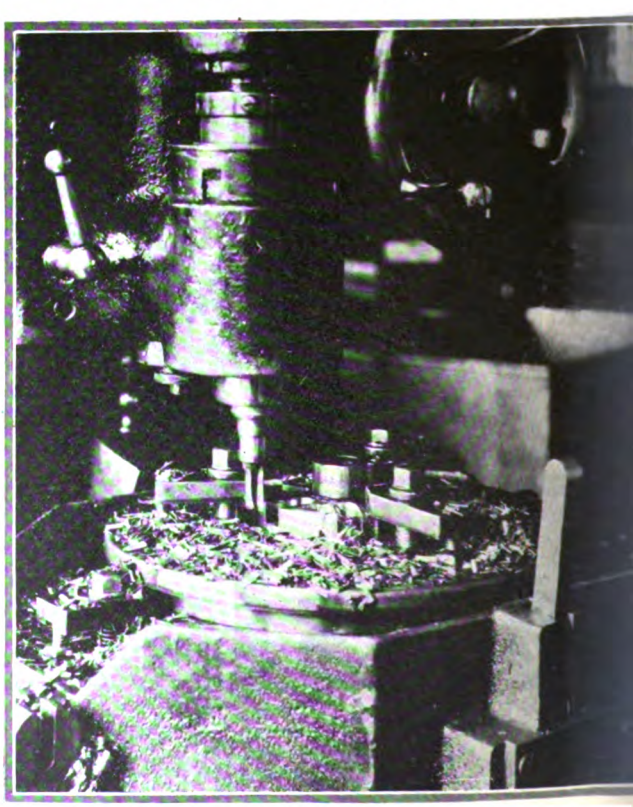
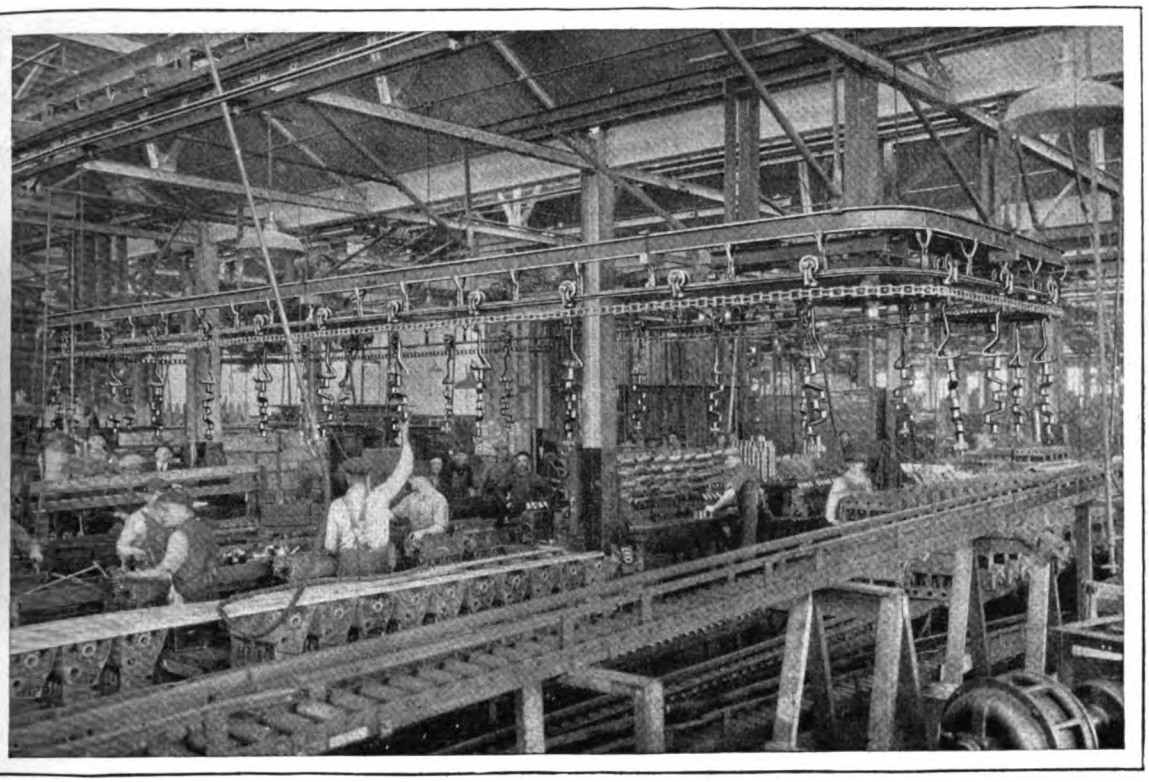


Fig. 15. Another type of drill intended to shorten up the length susceptible to vibration thus prolonging life.

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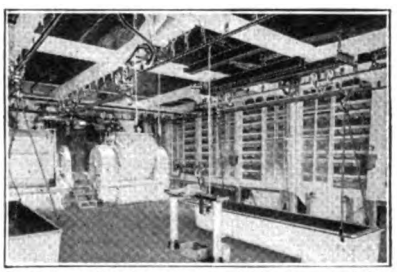
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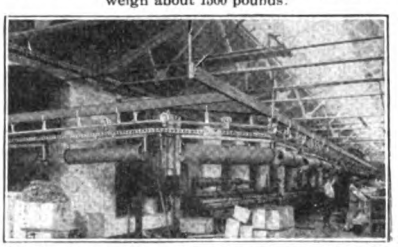
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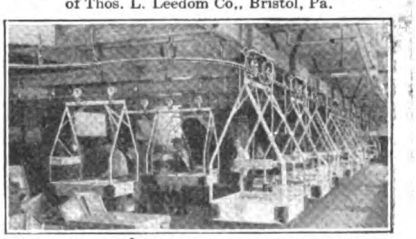
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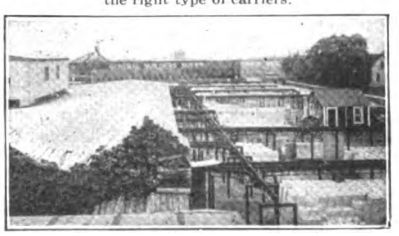
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Right and Wrong Wa

Equipment for Bench Work Will Last Long

By a Pra

ALTHOUGH it is hard to imagine any simpler tool than a hammer, most superintendents of modern machine shops complain that they have only one or two old timers working for them who really know how to use a hammer or other hand tools in a proper manner. This is unfortunate because, in spite of the fact that this is the age of machinery in which we pride ourselves on having much more mechanical power available for every worker than any other nation on earth, yet there is still, and probably always will be, a certain amount of work which can only be done satisfactorily with the old fashioned hand tools. Formerly every machinist learned how to use and care for them during his apprenticeship. Now very few ever give the matter much thought so that in establishments where the nature of the operations calls for a certain proportion, even if small, of hand tool work, it is usually necessary for the manager or superintendent to do some educational work or to get the local trade school to do it for him.

The reason why this question of hand tools is so worth while stressing is because if the tools are not used in the right way it is neither possible to do good work with them nor to make them last as they should. One shop man feels so strongly about this matter that he said he wished the industrial magazines would publish articles about hand tools at frequent intervals so as to give it the attention he is convinced it deserves.

As a matter of fact there are only a very few general classes of tools which need consideration. There are the hammer, the wrench, the file and hack saw (which are generically the same thing), the tools which are struck

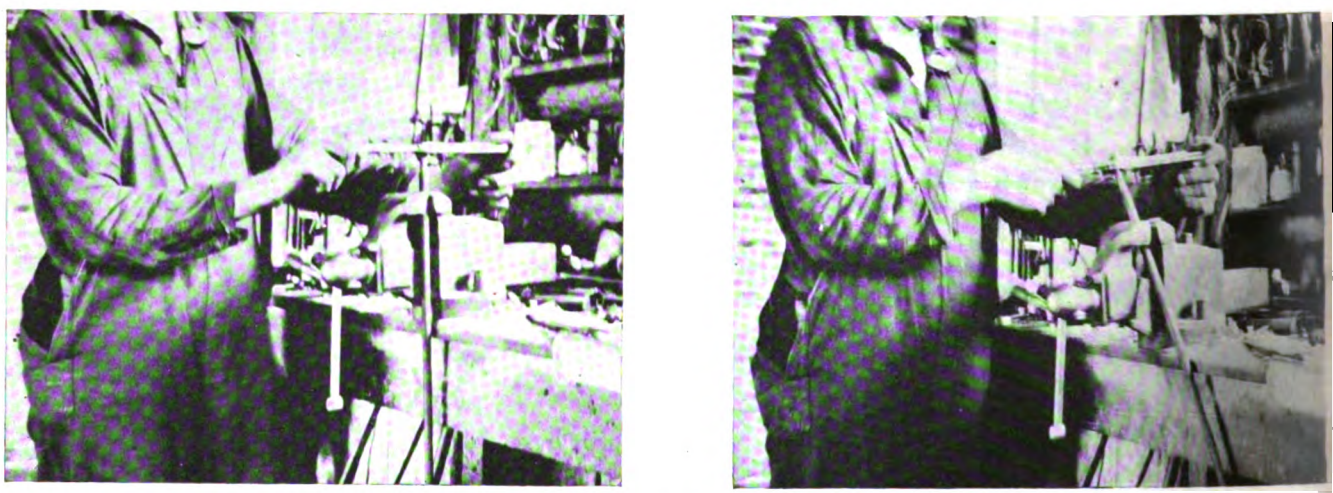


Fig. 1. The right and wrong way of threading a rod by hand. The piece should be clamped in the vise so that it is vertical and the die held firmly in a horizontal position.

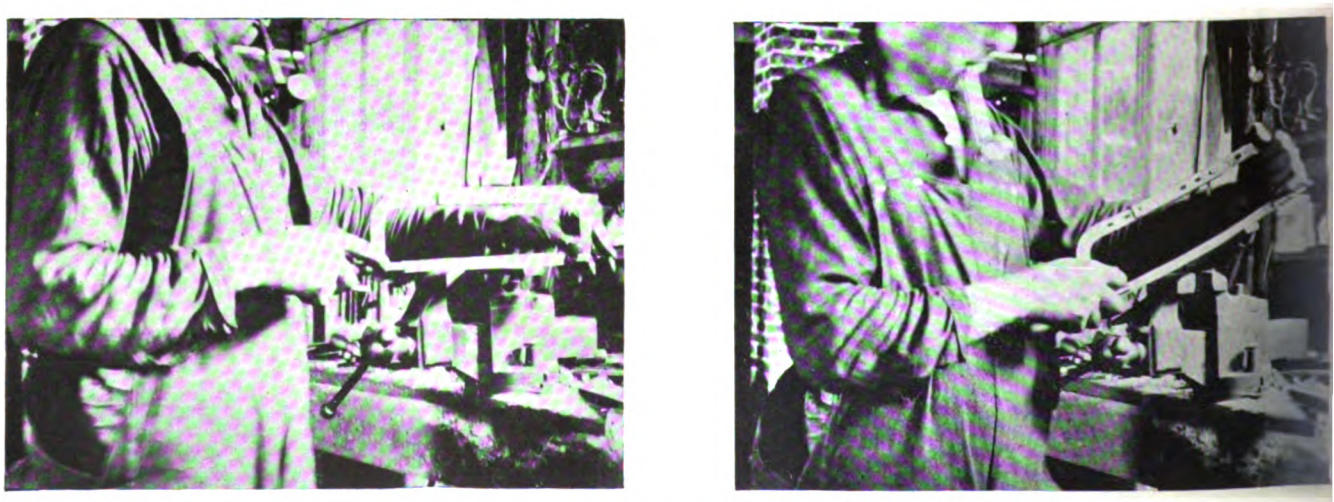


Fig. 2. The operator at the left is using a hack-saw correctly, holding it with the blade horizontal and normal to the work. The other man is following line of least resistance and doing a poor job.

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f Using Hand Tools

Workman Is Taught Correct Technique

p Man

with a hammer or a sledge, hand-drills, threaders, and finally, vises. This seems to cover the list except for modifications, which obviously cannot be gone into here.

In the first place the bench or vise supporting the work must be of such a height that the worker may hold his arm in a natural position; that is, vertical to the elbow with the latter fairly close to the body, and the forearm horizontal for such work as filing. This position of the arm applies to practically all bench work and if it is not right, proper use of the tools is impossible. Obviously if the height of bench varies so materially from what it should be that the worker cannot hold his arm properly any attempt to teach him right methods, even with the best of vises, is defeated before it is begun. Therefore, it is essential that work benches of the right height be provided if a really serious effort is contemplated for increasing the life of hand tools through teaching good technique in handling.

When using a file the proper way to hold it is in a horizontal position. The pressure of the thumb of the left hand is sufficient. If too much pressure is exerted a rocking motion results which spoils the work. Too much pressure also dulls the file with undue rapidity and may cause it to break. A rocking motion also results if the forearm and file are not held in a horizontal position. The back stroke must be free, otherwise the injurious rocking motion is almost sure to take place.

A piece which is being filed is frequently placed in a lathe. In such cases it is extremely necessary to use a uniform horizontal stroke lasting for at least a couple of revolutions without excessive pressure. To run the



Fig. 3. In chipping, the hammer should be held at the end of the handle and the chisel guided between the third and little fingers as at the left.

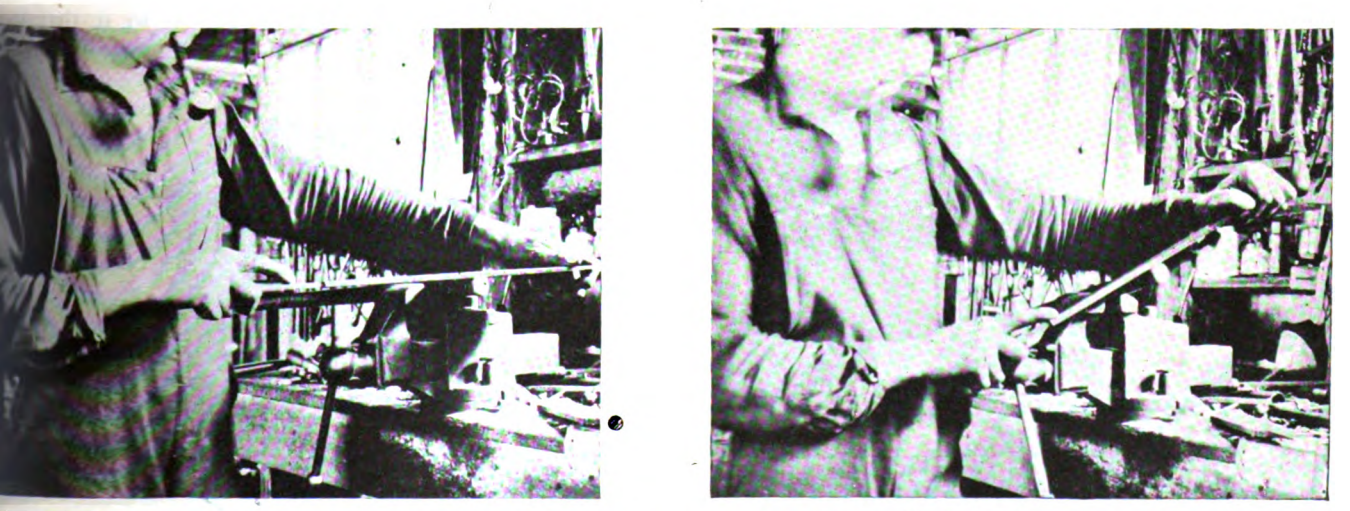


Fig. 4. The file should be used like a saw. It is held horizontally during the cutting stroke, not as shown at the right.

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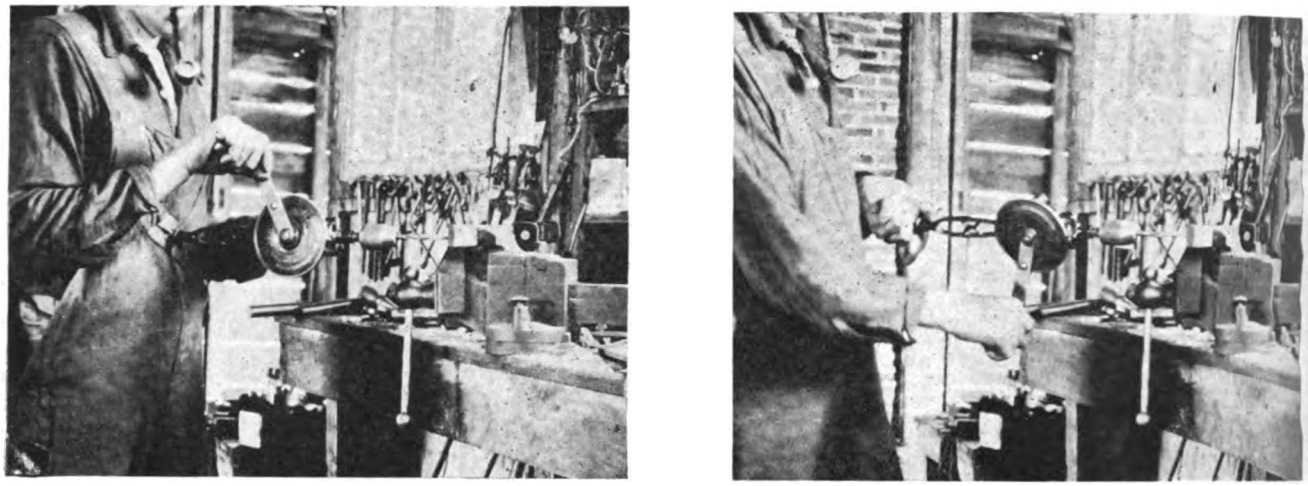


Fig. 5. Anyone can see which of these two methods of using a breast drill is correct. In fact an easy posture is nearly always indicative of the right method and an awkward one, of the wrong.

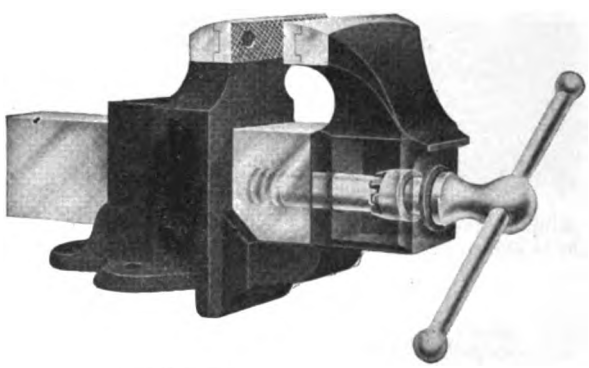
work at rather a low peripheral speed tend to glaze the file, and also to make ridges on the work. A uniform stroke lasting for a few revolutions causes a uniform wear along the whole length of the file rather than one worn out spot near the middle, while both ends are still good. Such method also eliminates the danger of flat spots.

One final thing must be said about files and that is that they should never be used without handles. The handle end should rest in the palm of the hand. If the handle is missing the workman runs great risk of hitting an obstruction of some kind with the other end and driving the sharp point into the center of his palm. While this may be said to relate more to the question of safety, rather than to means of prolonging the life of the tool, it is true that an accident will very likely result in damage to tool and to the work as well; and as it is one of the fundamentals of correct filing technique this admonition cannot very well be left out.

Hack saws are really special kinds of files and everything that has been said about the latter applies to sawing. As a matter of fact saw blades are more easily broken than files and any undue pressure, rocking motion, jerky stroking with attempted cutting as the back stroke will soon show by the number of broken blades. Perhaps the reason which will have the widest appeal for doing hand work in the right way is that the right way is the easier, physically and mentally.

The right use of the hammer, perhaps the first and most widely used tool man has invented, is very important, simple and yet very frequently overlooked. It should always be held at the end of the handle. The arm should hang straight down from the shoulder in a natural position with the forearm horizontal as in filing and sawing. In ordinary light work hammering is done by the wrist with moderate force. If done in this way there is a minimum of fatigue, strokes are accurate because the radius does not vary and the man may even look up from his work without stopping and without evil results.

A good machinist will always be rather fussy about the handle of his hammer. He will see to it that it is trimmed down below the



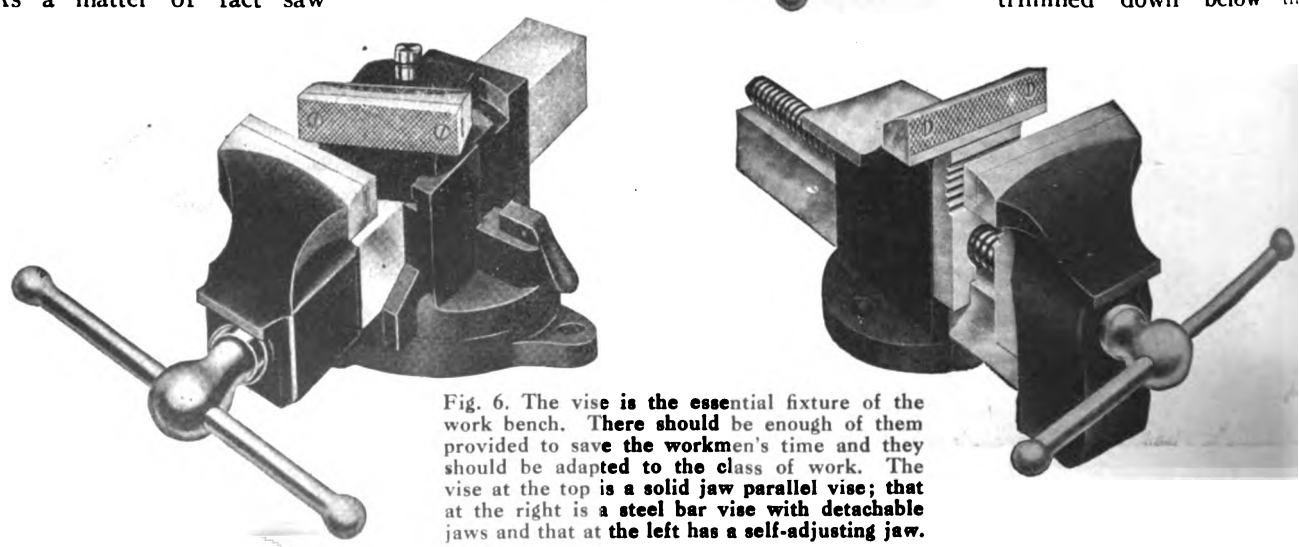
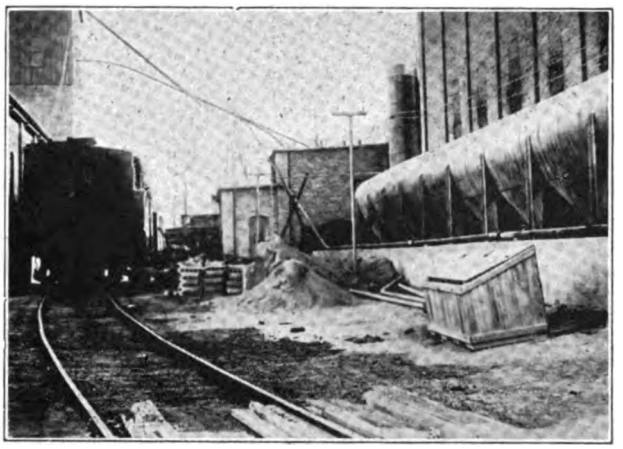


Fig. 6. The vise is the essential fixture of the work bench. There should be enough of them provided to save the workmen's time and they should be adapted to the class of work. The vise at the top is a solid jaw parallel vise; that at the right is a steel bar vise with detachable jaws and that at the left has a self-adjusting jaw.

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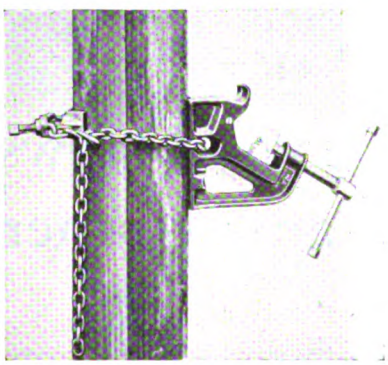
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Fig. 7. Below. A simple arrangement by which a pipe-vise can be rigidly fastened to a post. The chain and patented clamp do the trick.



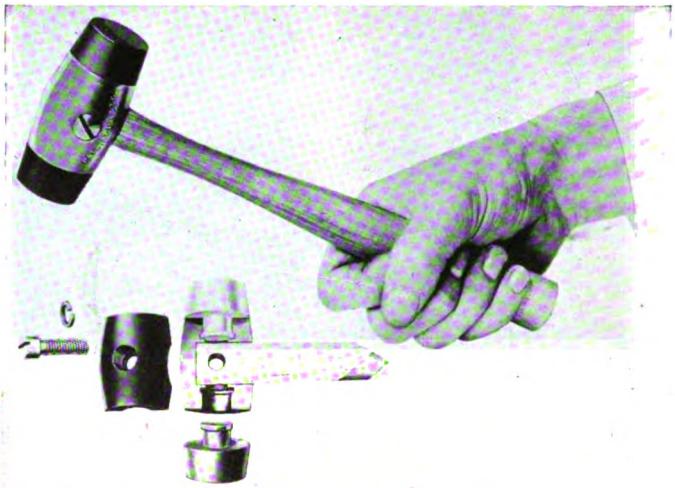


Fig. 9. A hammer with interchangeable tips which may be hard or soft as the work requires. The disassembly clearly shows its construction.

Fig. 8. Below. The side-opening inclined pipe-vise is handier for some jobs than a plain, straight vise.



Fig. 10. This wrench board panel for tool-cribs and shops comes ready to put up, complete with three sets of wrenches.

head so that it has a spring by which he is striking away from him. The face of the hammer should be slightly convex to prevent chipping which would result at times if a more or less sharp edge were struck by a plane surface.

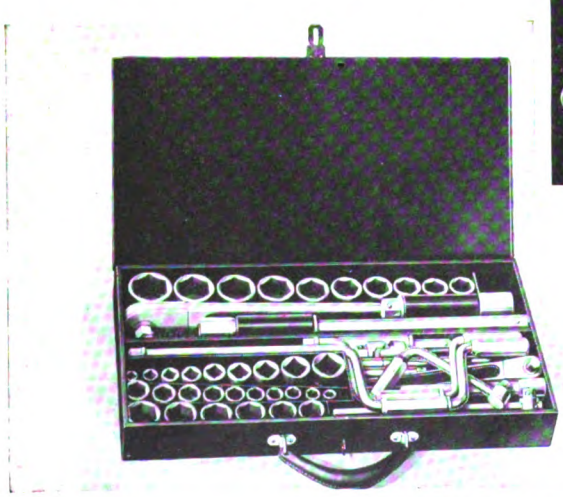
By observing these conditions it is not hard to see that maximum of ease is secured in controlling the blow of the hammer as to force and direction. This balance is all upset if, for instance, the hammer is held near the head. When done properly breakage and damage of both tools and work will naturally be the least.

Now comes the question of proper care and handling of the chisel, punch or other tool used with the hammer—if one is used at all. Of course, hammering in the right way has as much to do with getting the most out of these tools as anything—perhaps more. Holding the hammered tool correctly is also of importance both from the standpoint of safety and avoidance of undue punishment as well as from that of accuracy and quality of performance.

Chisels and center punches for light work should be held between the thumb and first two fingers. The other two fingers should act as a rest or guide to keep the hand and tool from slipping. When using a chisel to cut off a piece of sheet metal, for instance the cutting should be started at the edge of the piece and the edge of the chisel should be held at any angle of approximately 15° with the surface against which it is cutting. Obviously this way of cutting meets with much less resistance than if the chisel were held flat against the surface. Naturally the less the resistance and pounding

(*Continued on page* 104.)





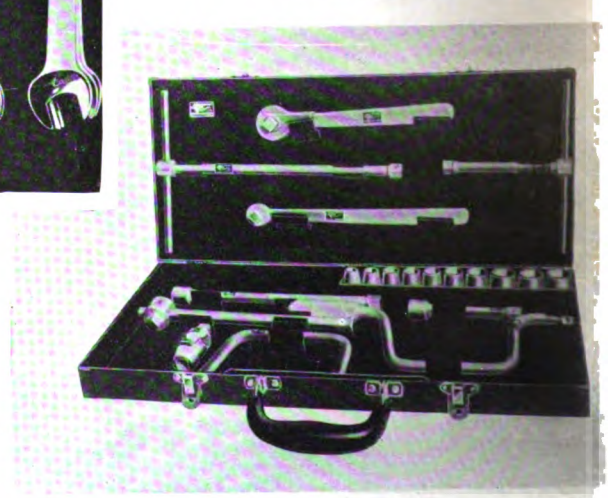


Fig. 11. One way to keep a set of wrenches intact is to use a packed kit-case like these socket wrench sets.

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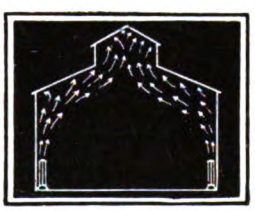
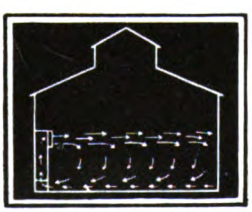


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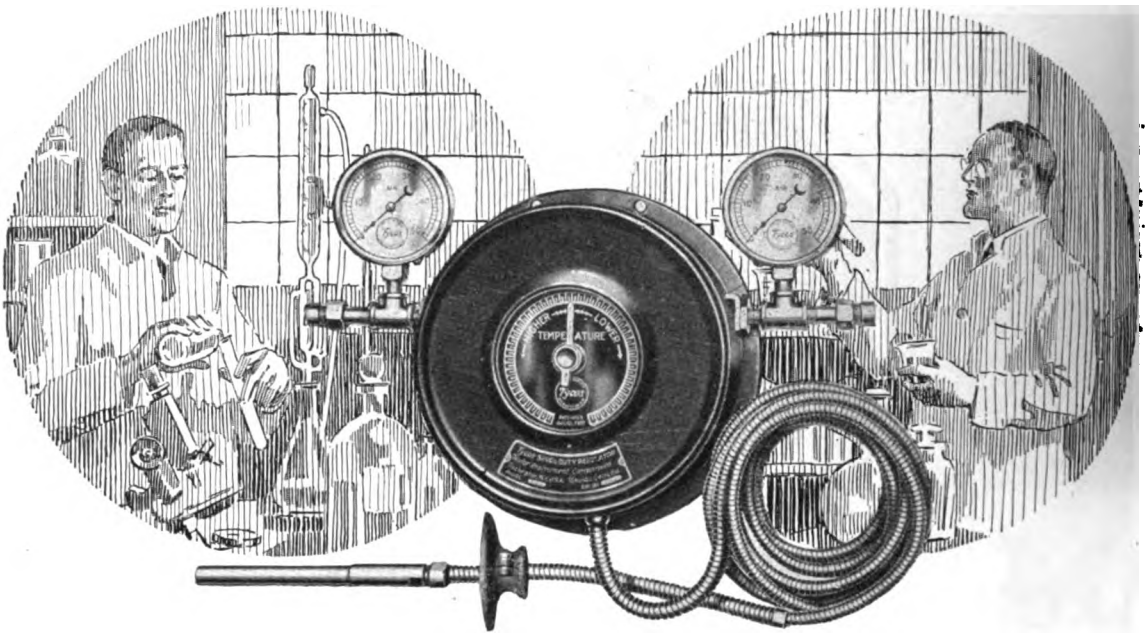
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By *Tycos Instruments*

IN the various processes of making chemicals, temperatures play a very important rôle. To insure the proper chemical reactions, the substances which go into the making of the chemicals must be heated to certain temperatures and held at these temperatures for precise lengths of time. Even the slightest number of degrees above or below might result in costly spoilage.

Naturally, such processes must be carefully controlled. To keep a constant check on all operations, the Newport Company, Carrollville, Wisconsin, have installed approximately 200 *Tycos* thermometers.

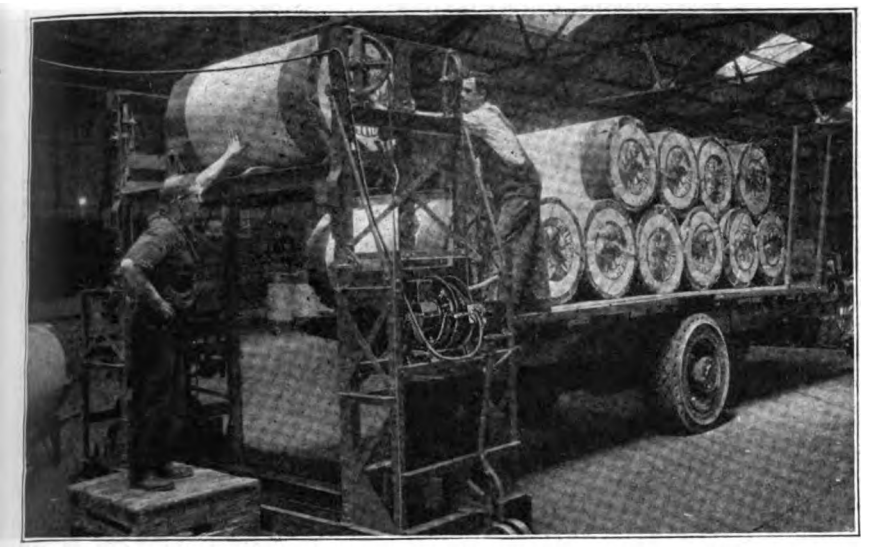
These thermometers serve a dual purpose: First, they serve as a guide to the workman. Second, they give those responsible for chemical control a complete record of what work the men are doing. This is particularly valuable on the night shifts so that those coming in on the day shift can see what has taken place the night before. The records are also permanent, which is important.

Perhaps you don't manufacture chemicals, but on some process you may need an absolute check, or control. Why not see how *Tycos* can safeguard your processes? Write for our catalog. If you wish, we shall be glad to have a *Tycos* Engineer discuss the difficulty with you.

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Tycos Temperature Instruments
INDICATING - RECORDING - CONTROLLING
Tycos, THE SIXTH SENSE OF INDUSTRY

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Constant Duty Reelite, with Ball Ring Cable Outlet as used in connection with electrically operated portable elevator in paper stock room of a large newspaper.

No cable in the way!

Power for this portable elevator is fed to the motor through Reelite

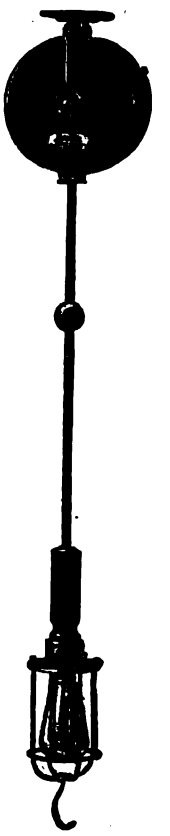
Smooth, quick handling of these heavy paper rolls is *assured*—at all times and without delays or hitches.

Because Reelite is on the job—tending cable far better than any man could do it.

Wear and tear on costly cable are almost completely eliminated, too. And the saving on cable renewals will usually pay for a Reelite in the first year or so.

Reelite is a soundly-designed, automatic cable-tender—reels the cable in, pays it out, keeps it clean, unkinked, uncut, never allowing a slack foot, yet exerting no undue tension.

You can save time and money in connection with *your* electrically-operated portable machinery by installing Reelite. A profusely illustrated bulletin describing all uses and all models is just off the press. Send the coupon and we will mail you a copy at once.



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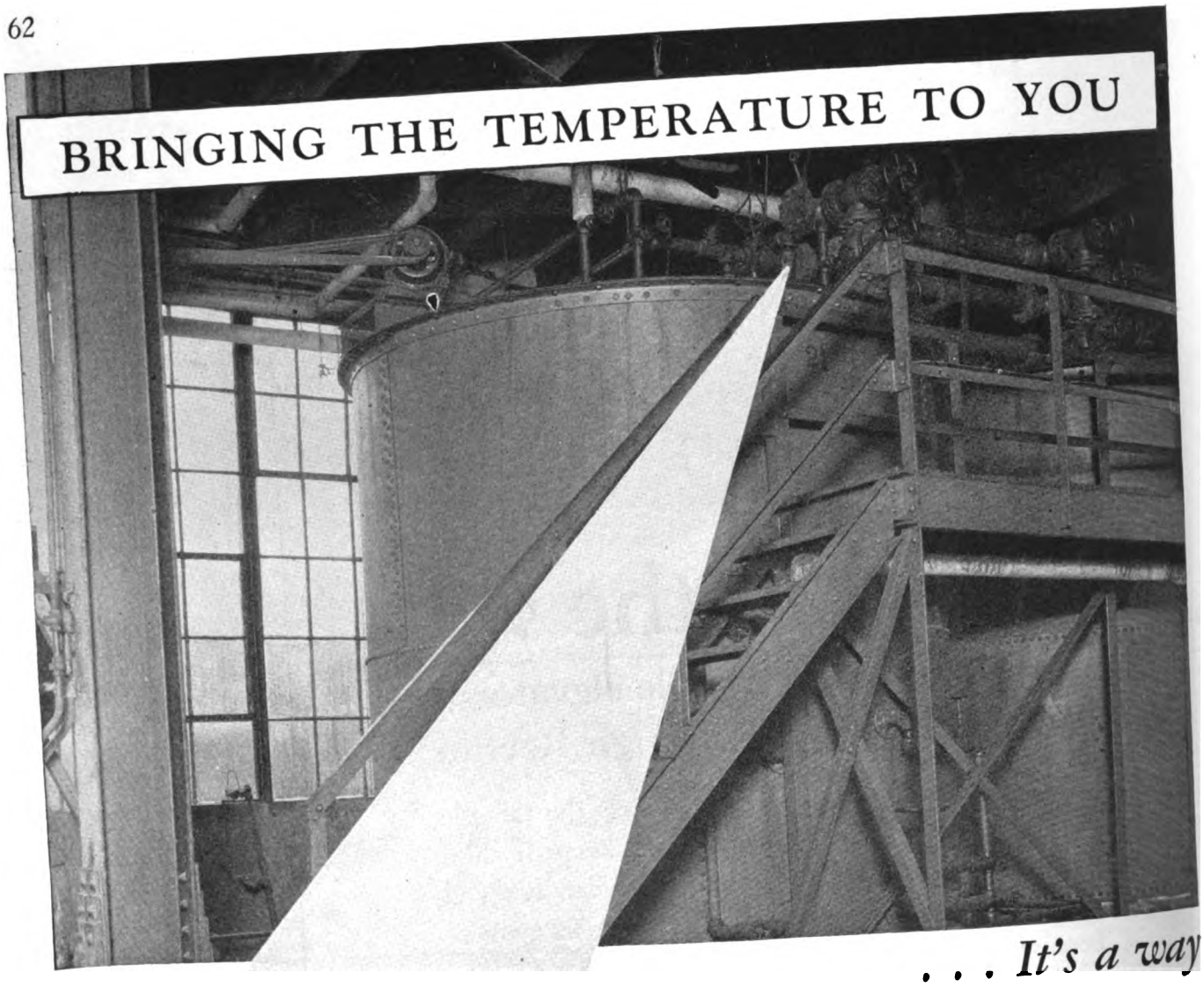
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Add this ease of reading to the inherent accuracy of the instrument and you will see why production managers instinctively vote for Motoco Industrial Thermometers.

For the technical facts, see free catalog No. 9.



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When the Metal Cutting Saw Pays for Itself

Correct Speed and Number of Teeth Prolong Its Life

By Leon I. Thomas

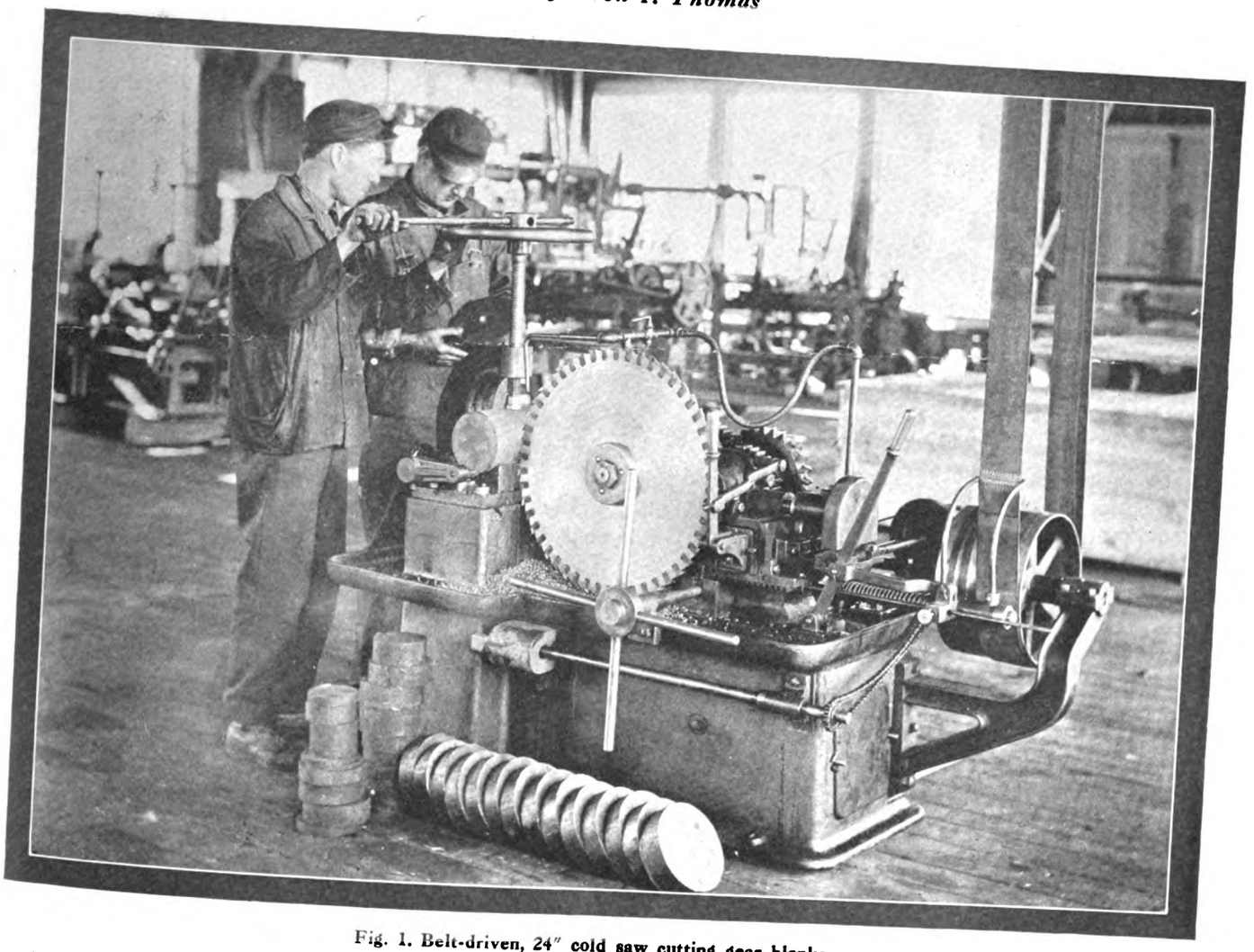


Fig. 1. Belt-driven, 24" cold saw cutting gear blanks.

AFTER all, a metal cutting saw with its multitude of teeth is only a single cutting edge to which the multiplication table has been applied. If, in the light of familiarity with present day efficient machine tools, your imagination is strong enough to visualize a single cutting edge being forced by hand along a piece of metal in which it cuts a groove you have a picture of the very beginnings of a saw—in fact, it is a one-toothed saw.

Follow that single cutting edge or tooth with another and another until you have say 22 or even 32 of them to the inch, each cutting the groove a little deeper than its preceding tooth, and you have a modern fine-toothed saw blade such as used for cutting brass, thin tubing and thin sheet metals. Before you get as far as the fine-toothed saw you have the coarser saw for the heavier work.

How well a metal-cutting saw does its job is not merely a matter of how clean a cut it makes. Modern business demands not only that a job be done well but also that it be done at a high rate of speed, that the tool which does it will continue to function for a long time, that its maintenance shall be reasonable—in other words, that as an investment it shall yield a good return. And whether the saw in question be a hand hack saw or a motor-driven machine tool, the same principle holds.

Anyone with metal to cut up certainly has no dearth of tools at his command. There is the simple, inexpensive but highly developed hand hack saw at one end of the scale, circular hot-saws which plow their way through red-hot metal at the steel mills at very nearly the cutting rate of a wood-saw at the other, and in between a large range of bench, portable and light power-saws of various types. Let us look at some of them from the point of view of the service they stand ready to give to meet the wide demands of industry.

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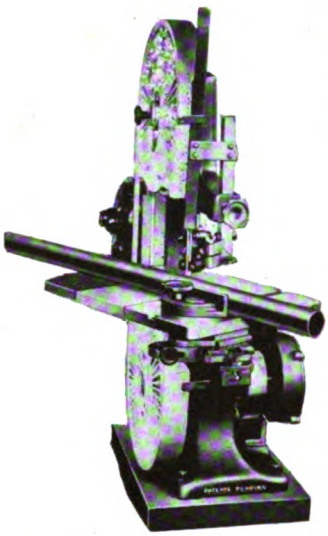


Fig. 2. This metal-cutting band saw is directly driven by a motor through two-speed transmission for thin and heavy work. It has a swivel table and guides to permit cutting long lengths of stock.

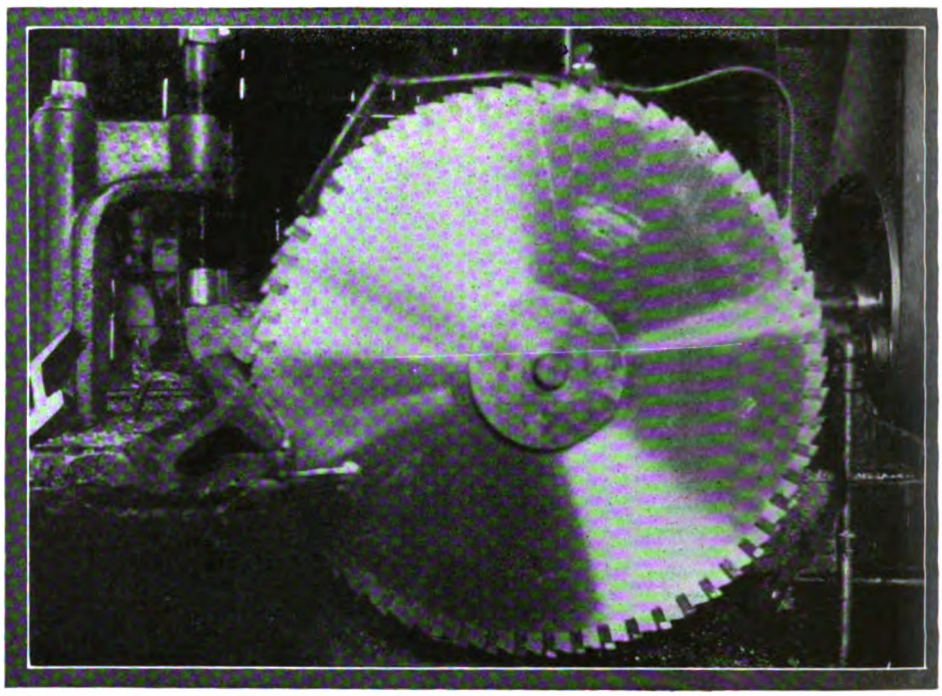


Fig. 3. For cutting T-rails or structural shapes this cold-saw is fitted with insert teeth with both end and side edges.

Before getting into the merits and functions of the specific types of saws it is well that the industrial executive appreciate certain fundamentals which apply to all metal saws. As to number of teeth to the inch, for example, it should be borne in mind that the spacing between teeth must be such that there are always at least two teeth in a cut at once. So it is that the thinner the metal to be cut the more teeth there must be to the inch. Beyond this consideration there is considerable disagreement among users as to the proper teeth to use. In general, however, it may be said that the harder the metal to be cut the finer should be the teeth.

And since, in the last analysis, a metal-saw is a milling cutter, like that tool, the greater the speed the greater the unnecessary friction. So the more quickly will the saw become dull with the greater speeds.

Probably no tool in the shop is more abused than the hack-saw blade. Nor does this abuse occur solely with its use in the hand frame. Unfortunately, workmen similarly misuse blades in the power hack-saw machines. If users would give this indispensable tool the same consideration that is given to milling-cutters, lathe-tools, and so on, bearing in mind that hack-saws are cutting tools and must be operated in accordance with accepted speeds and feeds applied to other cutting tools, longer life and greater efficiency of the blade would result.

A good mechanic would not think of operating a drill or lathe at a speed or feed faster and heavier than he knows, through his years of experience, to be correct. A drill that has prematurely dulled or is burned or broken is invariably evidence of misuse. This same evidence applies also to hack-saw blades.

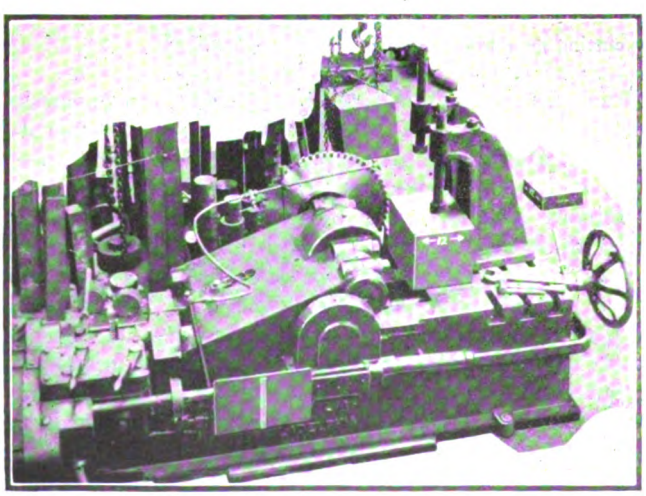


Fig. 4. A heavy duty cold-saw cutting 12 inch steel die blocks, at the rate of 12 inches in 18 minutes. Other bars cut are shown behind the machine.

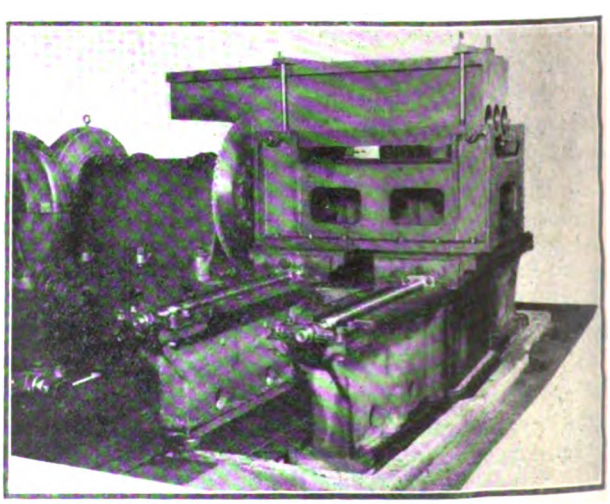


Fig. 5. This heavy 40 inch cold-saw is making cross cuts in the sleigh forging for an elevator machine set, above it. The depth of cut ranges from 2 to 9 inches and the width to 27 inches.

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A wolf's tooth for a clean cut—

A TERRIFYING snarl—a blurred flash of gray—the gleam of white teeth against hot red tongue—a slither of cut flesh, and there's a gash from jowl to shoulder as deep and straight and clean as though cut with the sharpest knife.

That's the sort of a cut left by a Lenox hack-saw blade—named for the famous old wolves of Lenox that ranged and ravaged the shores of Loch Lommond several hundred years ago.

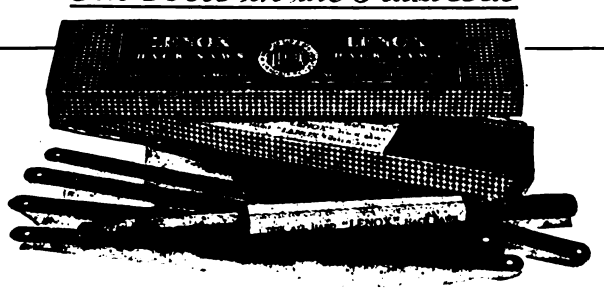
Through any kind of metal these modern "Wolves of Lenox" will bite straight, smooth and perfectly aligned. Every one of them is rigidly inspected before being packed; all of them absolutely uniform in performance. Money cannot buy finer blades than these "Wolves of Lenox."

They're easy to identify in any store—just ask for the blades in the plaid box.

AMERICAN SAW & MFG. CO.

Springfield, Mass.

"The Tools in the Plaid Box"



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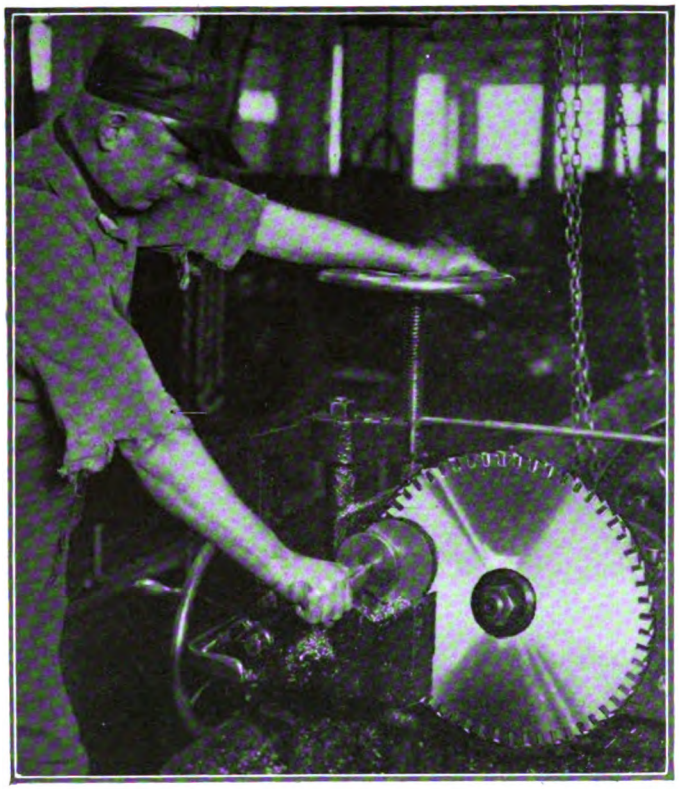


Fig. 6. How large work is clamped in a guide vise for sawing, the other end being suspended by shains.



Fig. 7. Gang cutting may be done in the same manner as shown in Fig 6.

Manufacturers of hack-saw blades who have devoted their entire manufacturing life to the development of metal-cutting saws offer the data contained in Tables I and II as recommendations which, although general, can be followed with the assurance of obtaining the longest cutting life from a saw consistent with reasonable production.

For special purposes special hack-saw blades are available. For instance, there is the screw slotting hack-saw blade for use in the hand saw frame only. As the name implies this saw is for cutting slots in screw heads. This blade is thick (sometimes as much as .1 inch) at the tooth edge and concaves toward the back, which is much thinner. Thus an ample clearance is provided which prevents binding.

Naturally hack-saw blades, like any other tool, will work best in the size of machine for which they are designed. So it is well in ordering blades to specify whether they are for hand frame, for a heavy, power, hack-saw machine or for a light power machine like that pictured in Fig. I. This latter outfit is typical of a machine designed to supply the demand for a moderate capacity but high grade metal saw which can be used as an auxiliary to the highn-speed machines. This motor-driven type, which is pictured, may be used as a portable since it runs without vibration and so does not have to be bolted to the floor.

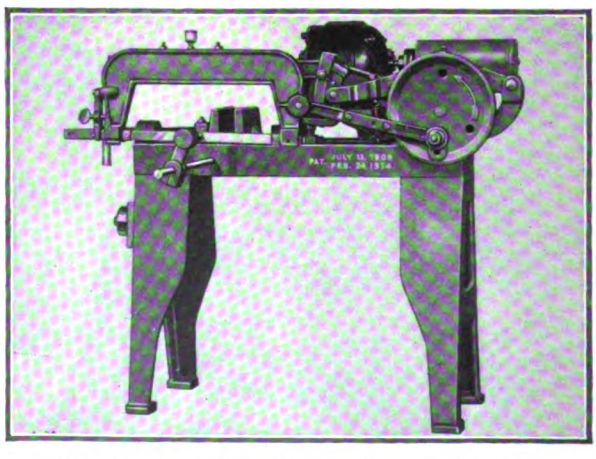


Fig. 8. A particularly strong type of motor d[illegible] hack-saw with worm-gear drive, stroke [illegible]ut regulators and take-up for wear.

The next step beyond the hack-saw in the direction of efficiency is the band-saw because in contrast with the hack-saw blade, all the teeth of the band-saw are used, giving a continuous cutting edge and a uniform distribution of wear. But here again the cutting ability of the machine depends upon the quality of the saw blade. Then, too, correct speed and temper are very important considerations to which adequate attention is not always given.

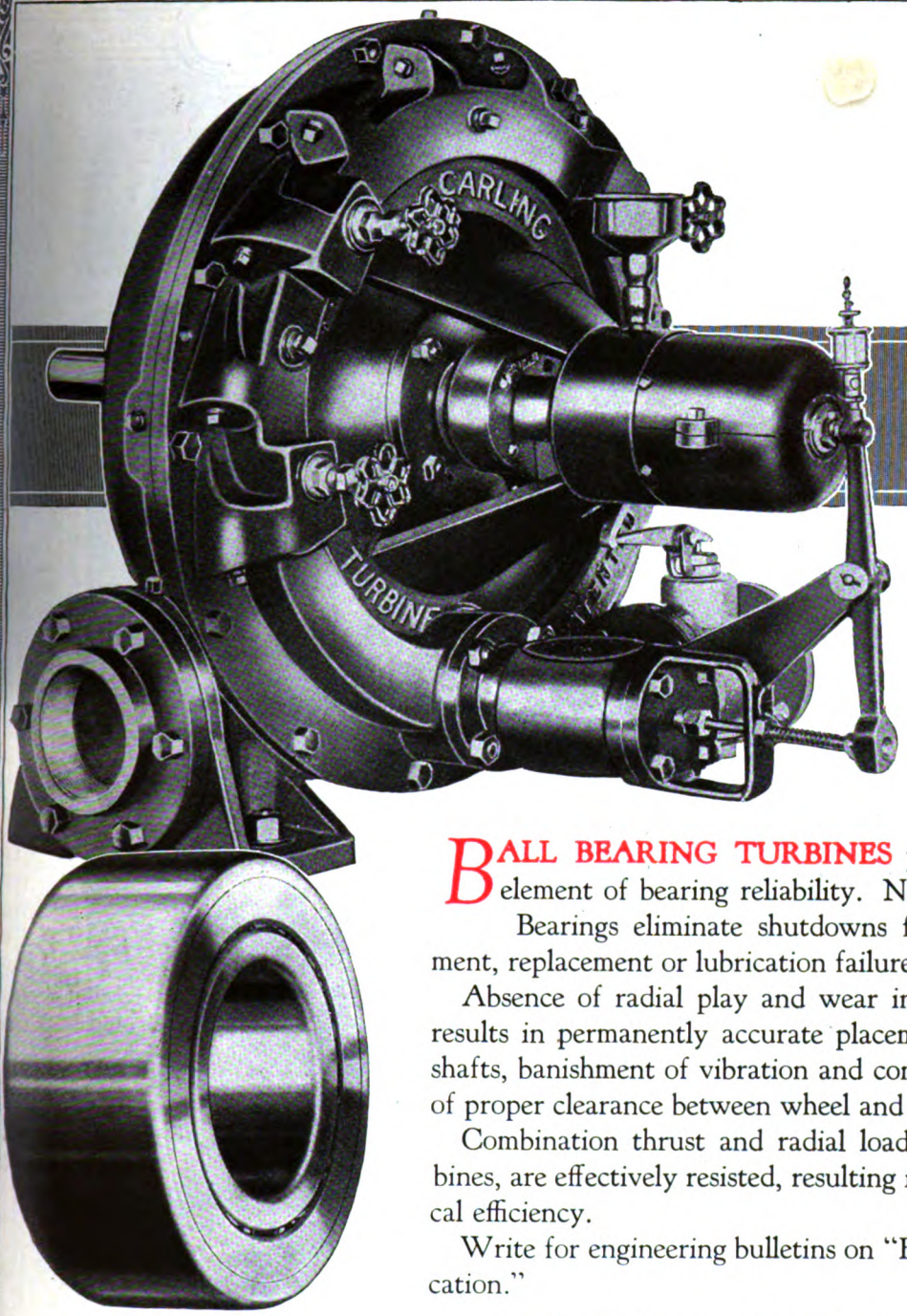
As with any other tool, it is possible to burn the cutting edge of the saw teeth by operating at too great a speed on hard metals. Nor is maximum cutting efficiency obtained by running at too low a speed on soft metal. The number of teeth per inch and the most efficient speed for various kinds of material, as recommended by one authority, are listed in Table III. In addition to this, the matter of set and temper is important. So the saw manufacturer should be appraised of the kind of material to be cut and his recommendations followed as to set and temper when specifying new saws.

Of course, you will run across examples of cutting quite at variance with the figures given in Table III, but "freak" cutting generally results in a shortened life.

Usually there is profit in dual purpose equipment for then the investment has a better chance to earn dividends over a greater percentage of the time. Such is the case with

(*Continued on page 77.*)

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The New Day in Aviation

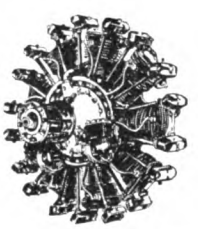
THE recent non-stop flights of Lindbergh, Chamberlin and Byrd presage a new era of progress in commercial aviation.

All credit is due these intrepid fliers and to the Wright Whirlwind Motors which made the flights possible.

The motors were as mechanically perfect as it was possible to make them and one cannot overlook the fact that the tools, machines and equipment used in the Wright Plant aided in the manufacture of this marvelous motor.

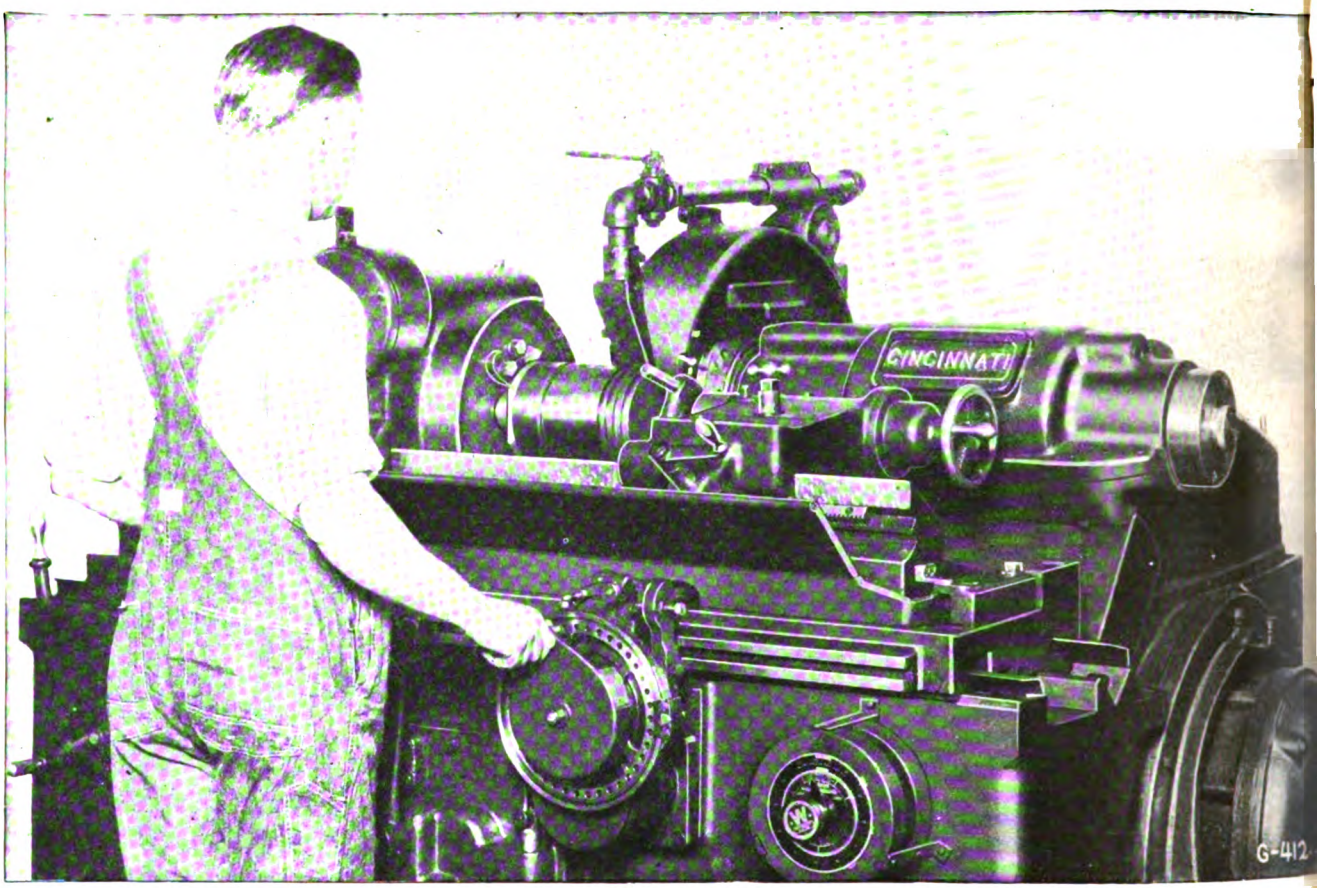
In order to obtain precision and accuracy in every part of the motor, all tools and machines used in the Wright Plant must be absolutely reliable and of the highest quality. Performance records of every machine and tool recommended their choice and purchase.

On the following pages are some of the tools, equipment and machines which aid in building the highest type of aeroplane motor in use today.

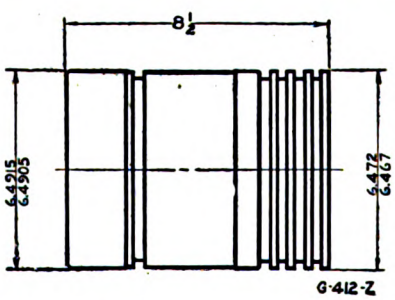


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Machine—Cincinnati 12-in. x 18-in. Plain Self-contained Grinder.
Equipment—Special live center Piston Grinding Adaptor.
Part Name—Piston No. D-44-R.
Material—Cast-iron.
Operations—Rough and finish grind two diameters all over.
Present Production — 25 per hour.
Old Production—10 per hour.
Stock Removed—.015-in.
Limits—.001-in.
Finish—Good.
Wheel Size — 20-in. x 3-in. x 12-in.
6026

25 PER HOUR ON THESE BIG FELLOWS

—and what is more interesting, this more than doubles th previous production, which was ten per hour.

This is a job from a large tractor manufacturer in the middl west who recently installed a 12-in. x 18-in. Self-containe Cincinnati machine.

It is only one of a great many jobs placed on this Grinde With a wide range of work, rotative speeds changed elec trically and with a range of twelve rates of table traverse, thi machine (self-contained motor drive) can handle a grea variety of parts. Heavy roughing cuts can be taken with slo table traverse as readily as light finishing cuts with a mor rapid rate of table traverse speed.

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IF YOU MADE TRACTORS!—

—and if you made 6" diameter pistons the chances re we could very decidedly increase *your* production, as we did on the job on the opposite page.

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n this period of increased competition where all oods produced increased profits must be found n lower costs. And that is where Cincinnati rinders come in strong.

Visit Booth 424 at the National Machine Tool Builders' Exposition at Cleveland, September 19-23.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI, OHIO

CINCINNATI GRINDERS

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How the Wright "Whirlwind" Motor Is Built

(*Continued from page* 16)

The incoming raw material, therefore, includes everything necessary for the manufacture of the complete motor: Aluminum pigs for aluminum alloy castings, drop forgings for crank-shafts, cylinders, gear blanks, connecting rods; stock for shafts and pins; bars for screw machine parts and sheets for manifolds.

All incoming stock is subjected to the most intensive tests and inspection, to determine its agreement with the specifications. The test specimen for connecting rod material, is taken from the core of the forging with a trepanning tool to determine its uniformity. Throughout the design of the motor, the most generous allowances are made for bearing and cooling surfaces, as well as for excess strength in the parts themselves and in the bolts and studs which hold them together. Castellated nuts and lock washers are used to prevent the possibility of any nut working loose. The tolerances allowed are extremely close, often within .001". It is obvious then that the workmanship and finish must be of the finest. All manufactured parts pass through a rigid final inspection before proceeding to the assembly room.

Finally, the completed motors pass through three tests which will be described later. Between the last two tests, each motor is entirely disassembled, completely re-inspected, repaired, if necessary, re-assembled and put through the final test. The motors are shipped complete.

The Manufacturing Departments

The plant at Paterson, N. J., is a complete self-contained unit. Here are located not only the manufacturing departments, but the general engineering offices, so that all the work is under the immediate supervision and direction of the officials of the company and their engineers. The corporation has discontinued the manufacture of airplanes, but the proximity of the Teterboro airport at Hasbrouck Heights offers ready facilities for flight tests.

The principal manufacturing unit is a four-story, flat-slab, re-inforced concrete building about sixty feet by two hundred and forty feet, with a one-story extension, about forty feet by forty feet at one end. The main building houses the executive offices, engineering department, foundry and the direct production departments.

A one-story building about sixty feet by one hundred and sixty feet accommodates the pattern shop, reconditioning department and the experimental department. The pattern shop is fully equipped with woodworking machinery for the manufacture of master patterns. Adjoining it is the reconditioning room, where motors which are sent back for repair, by purchasers, are again made serviceable. The experimental department is an independent machine shop having no connection with manufacturing processes. It is completely equipped with light and heavy machine tools, capable of performing all machine work entering into the manufacture of motor parts. It has its own tool-room and tool-crib and is operated under the personal supervision of the head of the company. Its sole purpose is the development of new models and the perfection of the others.

Apart from the receiving and shipping rooms, the principal production departments are:

1. The Foundry, in which the aluminum alloy castings for the cylinder heads, pistons and crank-cases are made. It is equipped with six tilting gas-fired melting furnaces, two sand-blast outfits, five gas-fired core ovens, molding machines, grinders, band-saws for cutting off sprues and other foundry equipment.

2. The Pickling Room for forgings adjoins the foundry in the one-story extension to the main building.

3. The Pipe Shop in which the tubing for the fuel intake and exhaust pipes and for the ignition wire is made up. The operations are largely at the bench consisting mostly of shaping, bending and brazing sheet metal.

4. The Gear Department, where the spur, bevel and twist gears are made for the valve gear and accessory drives. The gears are cut on milling machines, gear shapers, hobbers or bevel-gear cutters as the case may be.

5. The Automatic Screw Machine Department, in which screw machine parts are made up.

6. Heat Treatment Department. Practically all the parts entering into the construction of the motor, pass through the Heat Treatment Department for hardening, annealing, tempering, shrink fitting, etc. Here, for example, the cylinder heads are expanded for heating so that the valve seats and cylinder lining may be shrunk in place. There are two large electric furnaces, two large gas-fired furnaces and six small gas-fired furnaces. Five electric recording thermometers register the temperature of the furnaces.

7. The General Machine Shop, where all the miscellaneous drilling, shaping, milling, turning, grinding and boring operations are performed. Here, crank-cases are machined and drilled in successive jigs. The fins are turned on the cylinder liner by a duplex operation on a single machine. The pistons are turned and ground, the cylinders bored, shafts and pins grounds, connecting rods machined, and small parts finished.

8. Tool-Room, Tool-Crib and Storeroom. The tool-room at the Wright plant is necessarily more elaborately equipped than that of the ordinary machine factory. On account of the accuracy of all the operations, the use of special tools, jigs and fixtures, is almost universal. Some of these are highly complex because of the irregular shape of the parts to be processed.

9. The Assembly Department. Some sub-assemblies are made up in other parts of the plant and kept in finished stores until required. The general assembly of the motors, however, which also includes the sub-assemblies takes place in this department. Some of the steps in the motor assembly cycle are illustrated herewith. The completed motor is set up on blocks and given its first test after assembly. This consists, merely, of turning over the motor with power belted from the shop line-shaft.

10. The Inspection Department. Here all parts are subjected to rigid inspection, both before assembly and after disassembly, as previously described.

11. Test Houses. There are two specially designed one-story buildings for testing finished motors. Each is divided into three transverse compartments. In each of the outer two, the motor to be tested is set up, a saw-off propeller being mounted on the shaft. In the central compartment, are located the instrument boards and

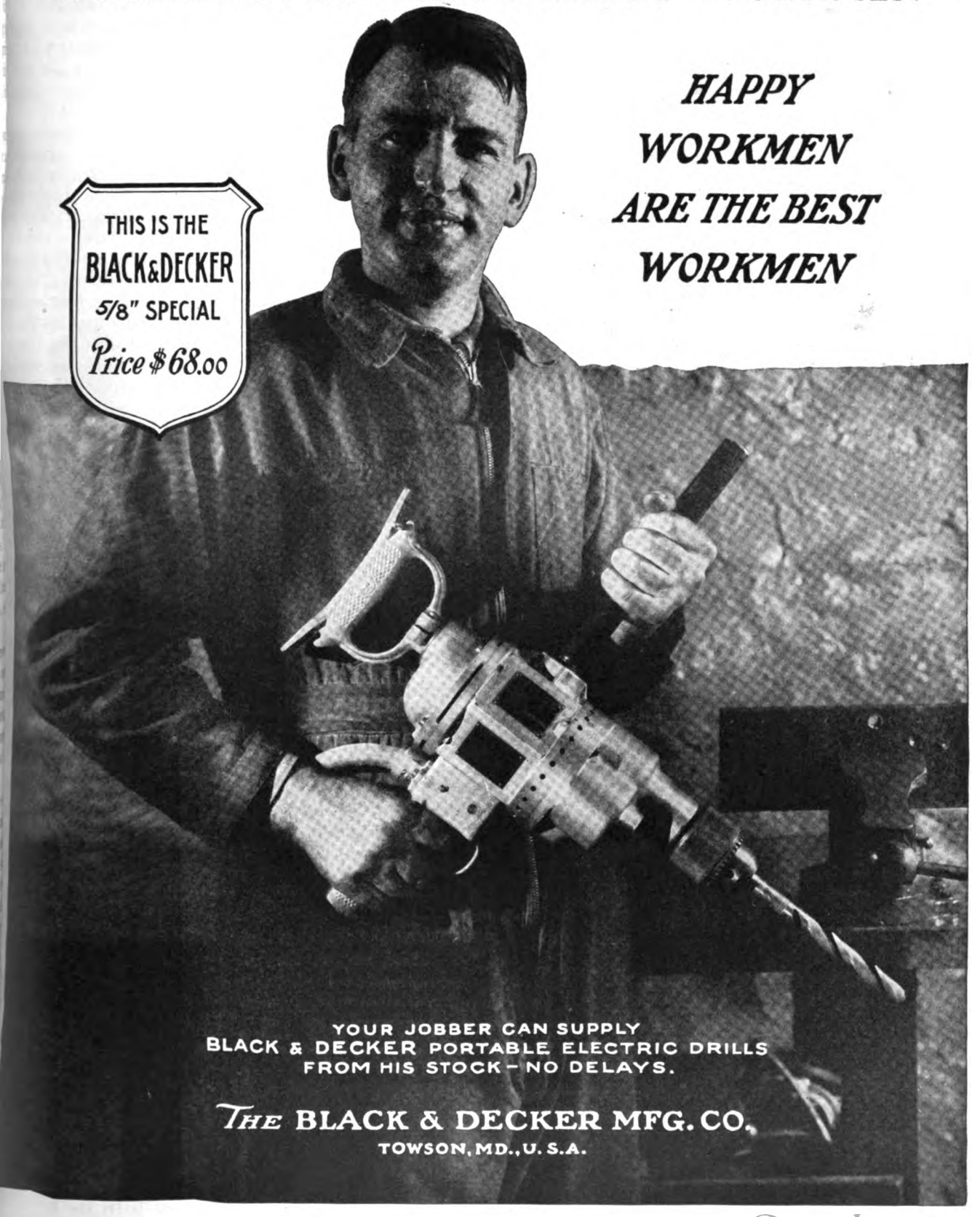
(*Continued on page* 74.)

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BLACK & DECKER

ELECTRIC TOOLS MAKE HAPPY WORKMEN



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GRINDING AT 10500 R. P. M.

3 SIZES ¼ ⅓ ½ HP.



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Extra Thin
Extra Long
Extra Light
Extra Strong



Drop-forged from chrome-vanadium steel, specially heat-treated and finished in nickel over copper, with heads buffed bright. Warranted not to break nor spread.

Here's a wrench that every mechanic will want on sight. The thin, narrow, powerful jaws make it easy to pull up nuts in unhandy places. Gives longest possible service under the toughest wear. Write for descriptive folder showing sizes and prices.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder
318 N. Francisco
CHICAGO, I

(*Continued from page 72*)

test operators. The motors are run at gradually increasing speed for 3 hours at which point they are delivering 90% of their rated power or 180 horsepower at approximately 1800 rev. per min. They are then run for 2 hours at this rating. This test is for the purpose of seasoning the valves and wearing in the moving parts to a good bearing surface. The propeller is then removed and the motor taken back to the assembly room where it is entirely disassembled. Any defect in material or assembly is caught at this time by a careful inspection. In case a replacement is necessary the engine is assembled and given a one hour test at 9/10 rated power after which the replaced part is examined. If no replacement is necessary the valves are reground and the engine reassembled.

12. The Dynamometer Room. The motor is now ready for final test in this department. Here, there are several power units for motors of various sizes. Those for determining the power of air-cooled motors consist of (a) a wind-tunnel in which the motor is set up, (b) a blower for supplying pressure in the wind-tunnel, (c) an electric cradle dynamometer for measuring the torque developed by the motor, and (d) a dynamometer scale.

The units for testing water-cooled motors consist simply of the dynamometer and scale. Each air-cooled motor is given a one hour test before acceptance.

When the motor has been passed by the inspectors, it is sent to the shipping room. It may be noted in passing that the cylinders were paint sprayed in the Heat Treatment Department. Crank-cases and other parts were sprayed in a similar manner. The present color scheme is: Cylinders—black, crank-case—battleship gray.

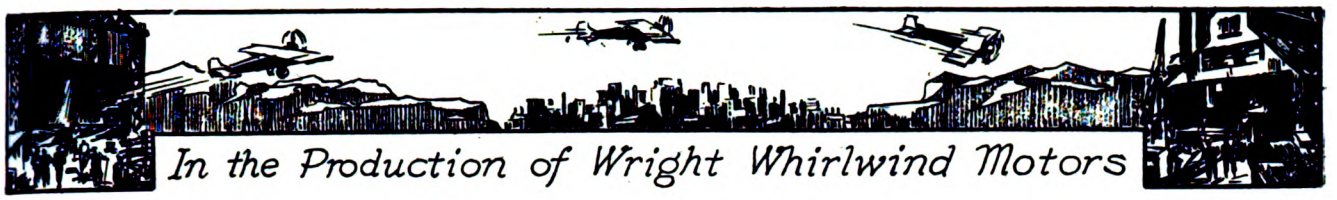
New models, of course, are subjected to much more severe tests. In fact, they are run at full rating continuously for fifty hours. From time to time, the engineers have undertaken to run a motor to destruction. The motor is run at overload and overspeed for several days in an attempt to make it destroy itself. It could not be done.

It is hardly necessary to dwell upon the shop methods and practice further than to reiterate that the workmanship must necessarily be high in quality since the tolerances are so fine that nothing else would be admissable. As the parts to be machined are so light, it is a simple matter to transport them from one operation to another, either in tote boxes or on hand trucks. At present, there are no conveyors in the plant and only a few hand lift-trucks are used. The distances to be covered are small and one elevator is sufficient to handle material between floors. Even the finished motor is comparatively light and is easily handled through the assembly and test operations by means of a hand chain hoist and mono-rail.

Chemical Exposition

An interest in the coming Eleventh Exposition of Chemical Industries that has grown to a proportion three times greater than in 1921 is indicated by the fact that when the doors open at the Grand Central Palace, September 26th to October 1st, 1927, there will be from 350 to 400 exhibits, many of which will be shown and discussed for the first time. In addition to the exhibits the various chemical societies which will meet here during the exposition are closely coöperating with the management to make this exposition the greatest in its history.

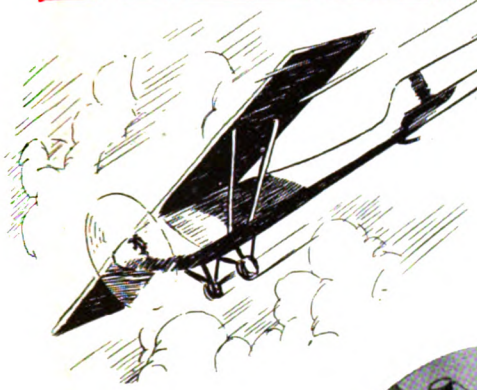
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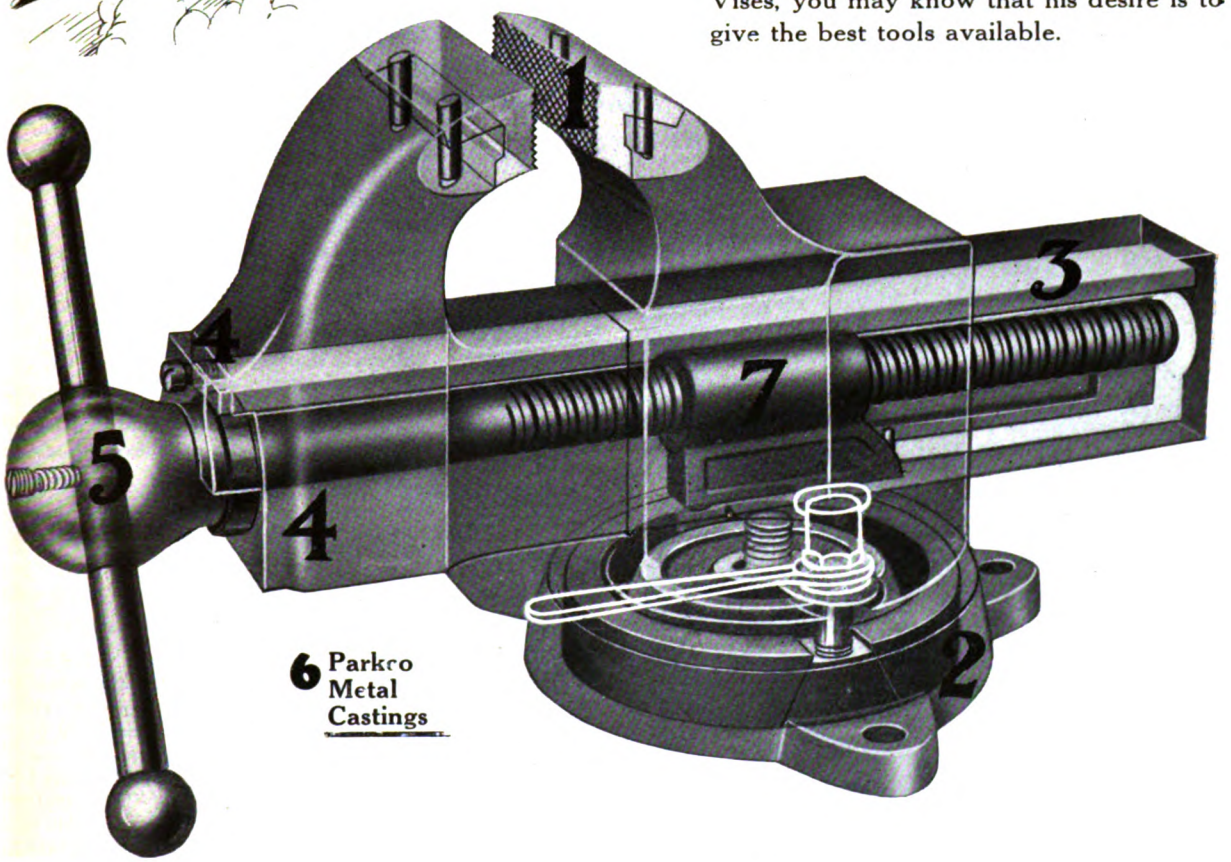
Where Only the best Tools are Bought—

PARKER VISES

Are the Choice



In every industry these smooth operating, extra strong vises are the choice. Built for long, hard service they are used in shops where economy and efficiency are practised. If your jobber handles Parker Vises, you may know that his desire is to give the best tools available.

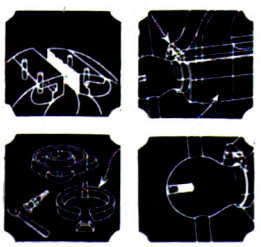


Seven Points of Superior Construction:

1 Steel Jaws carefully milled and pinned on. Can't work loose, yet easily removed if necessary. A Parker feature for 85 years.

2 Base made to fit the bench instantly without cutting. In Swivel Base Type special locking feature grips 360 degrees of base, making base firm as stationary type.

3 Solid Steel bar cast into slide makes slide extra strong.



4 Improved outside saddle permits easy removing of screw for oiling. Solid underportion gives added strength.

5 Tension spring and set screw hold handle wherever placed.
Can't slip and injure fingers.

6 Castings of Parkco Metal.

7 Extra Strong Nut and Screw.

The Charles Parker Co., *Master Vise Makers,* **Meriden, Conn., U.S.A.**

New York Salesroom, 25 Murray Street, New York City

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Cold-Drawn Hex. Sockets

Allen Process 30% More Strength

"ALLEN" *Cap and Set Screws*

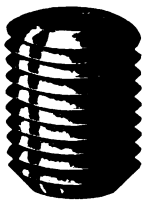
—Why They MUST Have the Strength You Seek

You have only to glance at the process illustrated here, to grasp what it means to the strength and economy of a Hollow Screw. Engineers seeing the picture have instantly sensed that here was the way *their* set screws should be made. Production men have recognized on sight the fundamental merit of the process, and straightway replaced their broached screws with "Allens." On the strength of the process alone, one is *sure* of the strength of the product.

Illustrating the Process

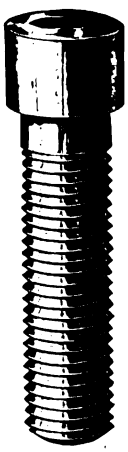


Here's the Allen process of making hexagon sockets in hollow screws. The left-hand figure under the picture shows the "blank" ready for drawing; note the extra thickness of stock around the upper half of the blank, to be cold-drawn down to the size shown in the lower half. The blank is inserted in a die under the punch press; is brought under a solid hex. punch (which exactly fits into the drilled hole); is driven through the die and drawn down to the finished size—simultaneously forming the hexagon socket. The figure under the operator's arm shows the socketed blank ready for threading, with 30 per cent increased strength due to increased density of the socket-walls.



Hollow (Safety) Set Screws

Hollow screws of Allen manufacture show 30 per cent extra strength over broached hollow screws—the only other kind made. By a patented process of cold-drawing we increase the density of the steel around the socket-hole, so that even the smaller sizes will stand all the strain that the best-made wrench can apply. The Allen process makes clean, perfectly-formed socket-holes, with no chips in the bottom as in broached hollow screws. The entire length of the Allen is utilized either for solid metal at the point, or depth of socket for the wrench. All sizes carried in stock, from ¼ in. to 1½ in. diameter; any length, point or thread at no extra cost.



Socket Head Cap Screws

These are the strongest, handiest screws for punch, die and jig work. The head of the Allen is finished all over and is turned true to the body of the screw. This accuracy enables you to set up the screw in a counter-bored hole without grinding off the sides. Scientifically heat-treated like the Allen safety set screw; threads die cut, accurate in pitch and perfect in lead.

Allen Pipe Plugs

These plugs give *service* where your malleable, cast or broached cold-rolled plug gives trouble. The hexagon socket—made by the Allen patented process—takes the spring-tempered, alloy steel Allen wrench with the same perfect grip as an Allen safety set screw. Accurately threaded and perfect in lead. Used in Wright Whirlwind Motors.

The Allen booklet will inform you fully about Allen products and the process accountable for their strength-features. With size and price-charts:—write for copy.

THE ALLEN MANUFACTURING CO.

127 SHELDON STREET HARTFORD, CONN.

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[illegible] St.

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W. J. McRae, 320 Market Street, San Francisco, Cal.

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The Metal Cutting Saw Pays for Itself

(*Continued from page 66.*)

band saws like that shown in Figure 2, which was designed to fill the need for a high speed metal-cutting band-saw, and is furnished with two speeds so that wood and soft metals as well as steel, iron bars and shapes may be cut. Then, too, there is the advantage that many of the lighter materials such as flat steels, iron pipe, formed sheet metal and so on can be cut at very much faster speed than that which is usually furnished on a metal-cutting band saw for solid bar stock.

Blades for band-saws may be obtained either in coils or cut to length and electrically welded.

Another way of getting the continuity of cutting edge which you have with a band-saw, and which is missing with hack saws, is to put the teeth on the periphery of a disc—in other words, the circular saw.

Circular saws as applied to the cold cutting of metals are virtually large milling-cutters and so they are frequently referred to as milling saws. Depending upon the specific use to which they are to be put, circular metal-cutting saws fall into a number of classifications. In each the diameters and the thickness of the blade differ.

For instance, take the metal slitting saw. This runs from 2½ to 8 inches in diameter and is used largely for making slits of specified size in metals, although they of course also do well a variety of cutting off work in the machine shop. Generally speaking, a slitting saw makes a deep slit: when the slit is wider and shallower you have what is known as a screw slotter. These latter generally have fine teeth, range from 1¾ to 3 inches in diameter and are used to cut slots in screw heads. They vary in thickness up to about .182 inches. Machines using screw slotter saws may be either hand fed or automatic.

TABLE I

How to Select Saw Blades for Heavy High Speed Metal Cutting Machines

Material to be cut	*Strokes per minute using cutting compound.*	*Strokes per minute without cutting compound.*	*Teeth per inch Recommended 18 ga.*	*16 ga.*
Machinery Steel—				
Large solids	100 to 125	50 to 60	10	8
Small solids	100 to 125	50 to 60	14-18	14-18
Angle Iron, Pipe, Channels, I Beams.	100 to 125	50 to 60	14-18	14-18
High Carbon High Speed Steels Alloy Steels				
Small Sections	60 to 100	50 to 60	14-18	14-18
Large Sections	60 to 100	50 to 60	14	10
Cast Iron	Must be cut without compound	50 to 60	10-14	10-14

When you have a saw that is thicker than .25 inch it generally gets a divorce from the family circle and changes its name to "milling cutter."

One of the disadvantages of a solid circular saw for metals is the difficulty of getting perfect clearance without destroying the strength of the plate. This is overcome in the inserted-tooth saw. Here the plate itself is made of a high grade carbon steel, so tempered as to give



Wrench Won't—

NUT SPLITTER WILL

Nuts peened or rusted on may be easily split by a Porter Bolt Clipper with standard Nut Splitter jaws (either side or end on). These tools in the largest size will easily split the nut of a 3-4" bolt, and if properly used will not damage the thread on the bolt.



Time Savers

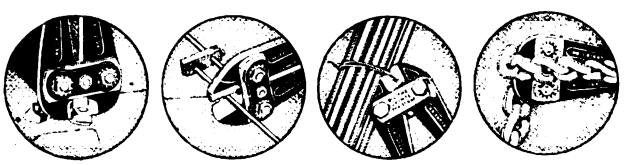
PORTER'S BOLT CLIPPERS

are cutting tools developing great power through leverage and a form of toggle joint. They multiply man-power about 70 times. Made in a number of styles for cutting bolts and rods, splitting nuts, cutting chains, etc. Moderate in cost and essential toolequipment for bench, shop, or kit.

Sold by Jobbers and Supply houses everywhere

Ask your dealer or write to us for booklet

H. K. PORTER, INC.
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The man who has once used a Prentiss Vise knows it would be mighty hard to find another vise that would please him half so much.

Everything about a Prentiss seems to check with what a man would put in a vise if he built it himself, from the castellated collar fastening—a Prentiss innovation—to the vise base, swivel or stationary. Every design advantage is intended to give the Prentiss strength where it's needed and to make the vise handy in actual use. And a Prentiss Vise is all of that on any job.

Which largely accounts for the popularity of the Prentiss Vise for the past half century—you're right again!

PRENTISS VISES
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VISE CO.
CHENEY HAMMERS
424

the required stiffness and strength demanded of the inserted teeth which are made of high-speed steel.

Saws of this type lend themselves well to use on heavy material, although thin material may be cut with them if the material is nested and several pieces cut at a time.

Just as with hack-saws, band-saws or any other cutting tool for that matter, no one circular metal-cutting saw is fitted for all purposes. So that executive who would get the most for his equipment dollar will see to it that he has saws well suited to his needs. One kind of material takes one saw and another another. With celluloid, for example, a saw of about 12 inches in diameter made of thin gage material and having a fine pitch works well. For electrotypes where you have both wood and electrotype metal to be cut at the same time a 5½ or 6 inch diameter saw of about .04 inch thickness with the proper temper does the job in good shape. And so it goes—a one best saw for each type of work.

TABLE II

How to Select Saw Blades for Hand Frame Use

Material	*Cutting Strokes per Minute*	*Teeth per Inch*
Machinery Steel		
½″ thickness or less	Not over 60	18
1″ or more	" " 60	14
High Carbon High Speed Steels		
½″ thickness or less	Not over 60	22
Over ½″	" " 60	14
Drill Rods		
¼″ or less	" " 60	32
⅜″ to ½″	" " 60	22
½″ and over	" " 60	18
Brass, Bronze and Aluminum Solids	" " 60	14

In cutting metals as recommended above, an all hard blade should be used.

A flexible back hard tooth hack-saw blade is recommended for the following:

Pipe and angle iron	60 Strokes	22 Teeth
Light Tubing and Light Sheet Metal	60 "	32 "
Conduit	60 "	22 "
BX Cable	60 "	22 "
Wiremold	60 "	32 "

Where a rather large burr is not objectionable the circular friction saw is a valuable aid. Structural shops use them to decided advantage. They cut fast and inexpensively. And there is a decided advantage with them in that varying sizes and shapes can be cut in immediate succession since there are no blades or attachments to be changed.

The cutting disc has no teeth but performs its function by friction. These saws are generally made in diameters from 24 inches up to 60 inches and operate at a rim speed of about 24,000 feet.

The inserted tooth saw with high speed steel cutting points has been generally adopted for work in various branches of the metal industry. Economy of operation and quicker production recommend it wherever speed and accuracy are essential in machine shop tasks. For heavy duty metal cutting this type of saw proves most satisfactory. While it is not a universal saw, it is adapted for service in most machine shops where thin stock can be nested and cut as a single unit.

In the important matter of clearance the inserted tooth saw has a distinct advantage over a solid saw, inasmuch as with the former it is possible to get perfect clearance

(*Continued on page* 80.)

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Presenting
The SIMONDS New Hard Edge Metal Cutting Band Saw Blade

Production and accuracy in cutting are features of this new Hard Edge Metal Band Saw which appeal strongly in the metal working field. Its wear resisting teeth of finest alloy steel are hardened to the bottom of the gullets, a method which eliminates cracking. Its stouter cutting points are machine milled, sharp and do not shell in hard cutting service. The blade is scientifically tempered to a degree that warrants faster cutting with minimum wear and the joints are *welded*, a method that eliminates breakage in direct contrast to the ordinary brazed blades. All Simonds blades are subjected to rigid inspection and frequent tests in actual machine cutting. Packed and shipped in protective cartoon containing 12 blades, welded and ready for use.

SIMONDS
SAW and STEEL CO.

"The Saw Makers"

ESTABLISHED 1832—FITCHBURG, MASS.

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		Portland, Ore.	**Montreal, Que.**	

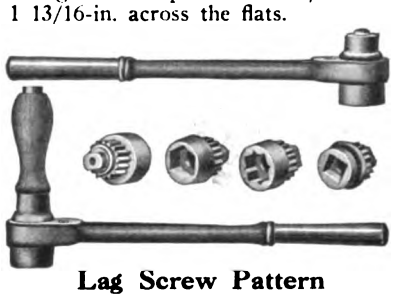
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SPEED THE JOB
Use
LOWELL
Reversible Ratchet Wrenches

A Wide Choice in
Patterns and Sizes
to Fit Your Every Requirement



1916 Pattern
Finished all over. Gear openings both hexagon and square from 1/4-in. to 1 13/16-in. across the flats.



Lag Screw Pattern
Finished in black enamel with socket openings both hexagon and square from 1/2-in to 1 13/16-in. across the flats.

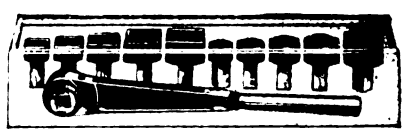


Steel Socket Bridge Pattern
Finished in black enamel with socket openings both hexagon and square from 1-in. to 5-in. across the flats.





Bridge Builders' Pattern
Finished in black enamel with gear openings both hexagon and square from 1-in. to 4 5/8-in. across the flats.



Multiplex Set
No. 1—Capacity 1/4-in. to 3/4-in. inclusive.
No. 2—Capacity 3/4-in. to 1 1/4-in. inclusive.
Expressed in bolt diameters.

LOWELL
WRENCH CO.
WORCESTER, MASS., U. S. A.
"Ask Your Hardware Dealer"

(*Continued from page 78.*)

without destroying the plate strength. The teeth have a clearance on top, a clearance backward on the periphery and a clearance downward toward the center, thus eliminating all friction on the sides of the teeth and on the saw plate. The high speed cutting edge only engages the work.

Speed is an important matter in connection with the use of the inserted tooth saw. Regardless of the size of the saw, it is essential that the rim speed should not exceed 40 feet per minute when iron or steel are being cut. The following example will illustrate our reason for speaking of rim speed rather than the number of revolutions a minute: "In one place they were running a 33-inch saw on the saw arbor on which they had been using a 22-inch saw, with the result that, while the 22-inch saw did well, the 33-inch saw would dull before it had made a cut. The revolutions per minute were slowed down so that the rim speed with the 33-inch saw was the same as it had been with the 22-inch saw and there was no further trouble."

TABLE III

How to Order the Correct Band Saw

Material	*Number Teeth*	*Most Efficient Speed*
Aluminum, Cast	8	1,000 to 3,000 f. p. m.
Aluminum, Sheets	8	1,000 " 3,000 "
Bakelite	6-8	500 " 1,000 "
Brass, Solids	10-14	300 " 500 "
Brass, Pipe	14-22	1,000 " 1,500 "
Bronze, Aluminum	14	150 "
Bronze, Castings	14	125 "
Bronze, Manganese	14	100 " 125 "
Die Block Steel	8-10	125 "
Fibre	8-10	500 " 1,000 "
High Carbon	10-14	100 "
High Speed Steel	10-14	100 "
I Beams	10-14	150 "
Iron, Sheet	14	150 "
Low Carbon Steel	10-14	125 " 200 "
Rails	14	100 "
Steel Pipe and Tubing	14	125 "
General Cutting	14	100 " 125 "

Upon the degree of stock hardness depends the amount of feed that can be applied. In cutting hard stock with a fine grain a greater strain is applied to the saw as well as the machine, and more power is required to drive the blade through it. Consequently the saw becomes dull more quickly. For stock that is soft, tough or stringy, perfect clearance and a considerable amount of hook must be maintained and the chips broken up. Otherwise the material will cling to the face of the tooth and result in the saw running hard or sticking in the cut. It is advisable to run the saw for the first cut two or three inches at about the speed that is to be maintained after it has been sharpened or when a new saw is put on the machine. This allows the burr thrown up in the sharpening to smooth off and reduce the possibility of breakage which might be caused by a tooth left a little too high. A good way to regulate the amount of feed that can be safely carried is to feed through a cut by hand. A little practice will enable the operator to feel how the saw is going in the cut and when it is carrying the proper amount of feed.

It is not economy to run an inserted tooth saw after the keen edge is gone. The saw loses clearance and the teeth are rubbing, not cutting. At this stage they dull rapidly, use more power and often cause damage.

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Who Says Purchasing Agents Are Price Buyers

Mr. L. W. Lang, Purchasing Agent for the well known firm of Ireland & Mattews, says:

> **"We have found American Swiss Files to be uniformly satisfactory as to Quality, Life and Cost and take the opportunity to place ourselves on record as being a satisfied user of your product."**

They are one of the many firms who have standardized on American Swiss Files of precision.

Why not give us an opportunity to add you to the list of manufacturers who have solved their Filing troubles by using American Swiss Files.



AMERICAN SWISS FILE & TOOL COMPANY
410 Trumbull Street, Elizabeth, N. J.



To Cut Costs—to Do Fine Work, Use This Saw

FOR absolutely accurate work on the finest cabinet and pattern jobs in either hard or soft wood, the H & A Portable Electric Bench Rip Saw is ideal for large and small manufacturers.

While doing excellent work, this machine reduces production costs because it saves time and labor, being moved quickly wherever needed in the busy plant. The No. 8 H & A Rip Saw is a guaranteed machine, built with the best materials and workmanship.

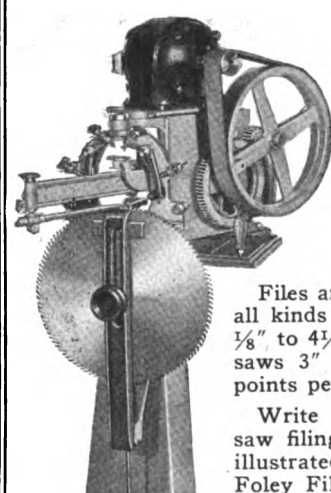
All the H & A line of portable electric woodworking machinery, consisting of the rip saw, band saw, swing saw, jointer and lathe, are self-contained units, taking up small floor space and can be moved to any part of the shop on a moment's notice.

Write for further details about these machines which are sold through dealers.

HESTON & ANDERSON
823 W. Depot Ave. Fairfield, Iowa

Machine Filed Saws Cut Faster, Cleaner, Truer!

You can get better service from your saws if they are filed with machine precision. You'll save time and money, too,—file hand saws in 5 to 10 minutes, band and cross-cut circular saws in less than half hand filing time.



FOLEY
Automatic
SAW FILER

Files and joints, in one operation, all kinds of hand saws—band saws ⅛" to 4½" wide—cross-cut circular saws 3" to 24" in diameter—all, 3 points per inch and up.

Write for special demonstration saw filing offer, and also complete illustrated information about the Foley Filer.

Foley Saw Tool Co., Inc., 16 Foley Bldg.
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Thor Tools and Literature are Distributed Throughout the World



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These foreign business men are willing to pay a great deal more for *Thor* Tools, only because they have found that it pays them to do so. And this idea is rapidly growing as indicated by the large increase in our foreign business.

This, we believe, proves conclusively that not only American, but foreign business men have learned through experience, that it is the cheapest in the long run to use QUALITY ELECTRIC AND PNEUMATIC TOOLS.

The demand for Thor Tools necessitated the printing of the foreign language circulars as shown on this page. If you haven't seen the American version of them, we'd be glad to send you copies. Full of real, meaty facts which will prove unusually interesting.



WE ARE ALSO MANUFACTURERS OF A COMPLETE LINE OF INDUCTION TYPE, 180 CYCLE ELECTRIC DRILLS. WRITE FOR INFORMATION.

TOOLMAKERS—SINCE 1893

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PNEUMATIC TOOLS

GENERAL OFFICES
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You or Your Employees are called upon to repair or replace worn or broken bolts and nuts on automobiles or other machinery,

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You Own Machinery or are responsible for production without costly shut downs—

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You, Your Shop, Your Millwright or Your Mechanics Need a Little Giant SCREW PLATE

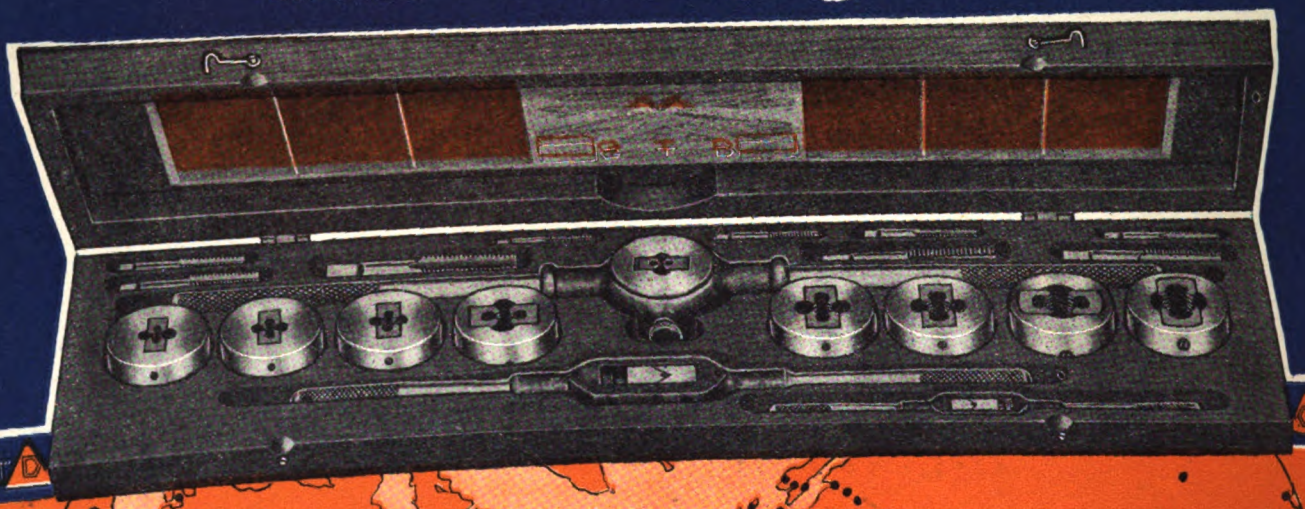
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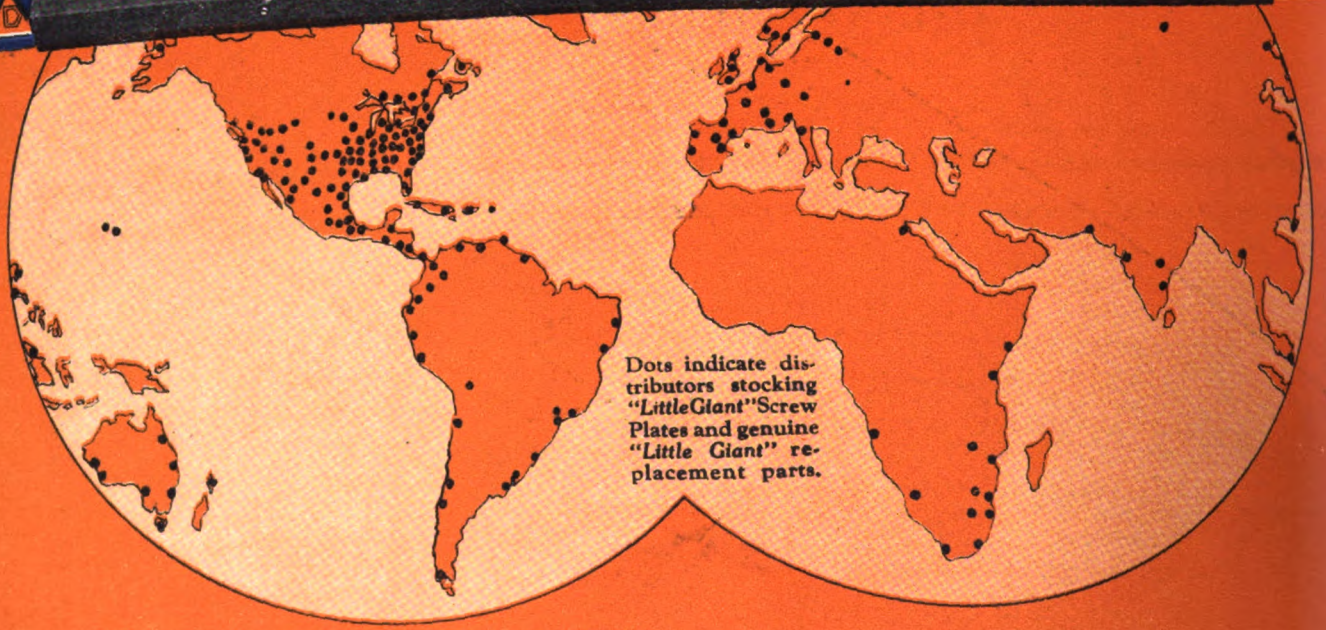
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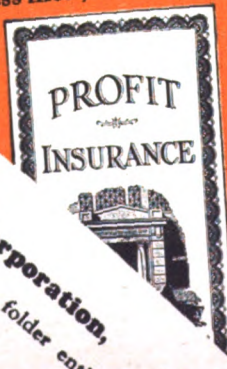




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High Speed Drills

With **46** years' experience

we pronounce the *Red Shield* the best Drill yet produced

Should be used in every progressive shop where "cost reduction" is the slogan.

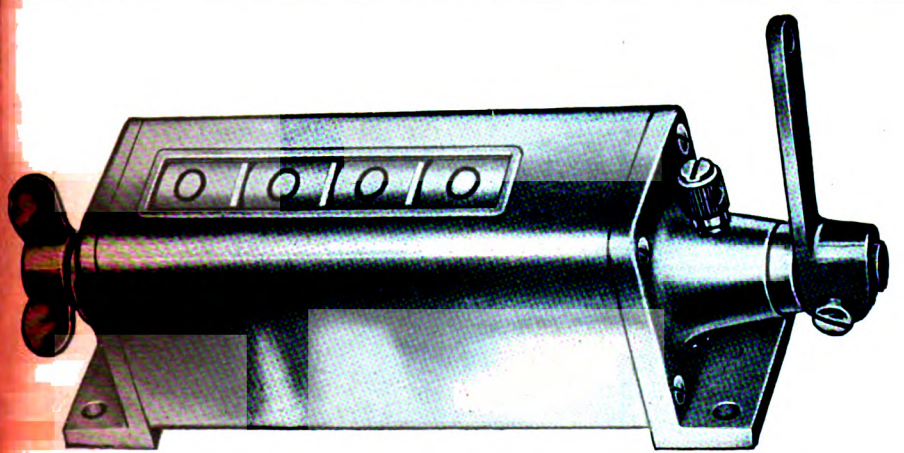
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Veeder

Set-Back Counter

Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

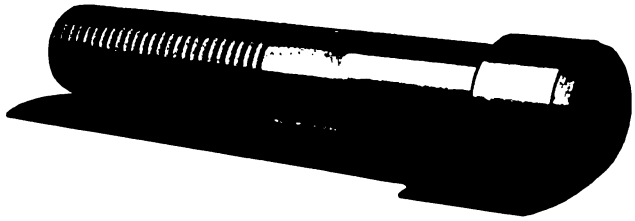
Put the production-count in front of the worker; face him with his work-and-wage-record:—then the count gets *action!* It gets *more work,* for work alone will register more product—more pay. Your workman's eye is on the count; his mind is on the job. And "mind-on-the-job" means *money in profits;* less labor-cost; less supervision. The Veeder booklet will point the way with the proper Counters.

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Nickel Steel



—and *forged* for greater strength

Bristo socket head Cap Screws are made to take the terrific strain of heavy punch and die, stamping and similar work. They have a generous margin of strength and toughness which can be acquired only by forging nickel alloy steel.

This extra strength means longer life and time saved by less frequent replacements—lower maintenance expense. In your product, Bristo Cap Screws give added assurance of dependable performance and satisfied customers.

Bristos cost less than many other socket head cap screws which cannot match Bristos in strength, holding capacity or wearing qualities.

Let us send you sample screws to test. Try them on the hardest job in the shop. See them in action.

When you write for test samples, ask for the new discounts and Bulletin CE 821 describing the line. The Bristol Co., Waterbury, Conn., makers of Bristo hollow safety set screws.

See OUR EXHIBIT NATIONAL STEEL & MACHINE TOOL EXPOSITION DETROIT CONVENTION HALL Sept. 19-23 BOOTH 274A and 335

BRISTO Safety SET SCREWS

Use the One Best Chuck

(*Continued from page 22*)

regularly and irregularly shaped pieces are worked on.

Because work must be held both from the outside, in the case of solid pieces, and from the inside with some hollow parts, it may be well to remind ourselves of the three general ways in which most chuck manufacturers meet this requirement. First, there is the use of the same set of jaws which may be reversed in the chuck slots; second, the provision of a separate set for each kind of grip, and third, reversible jaw tops which are mounted on non-reversible bases. With this three-fold solution available, all conditions may be readily met.

Special Chucks for Special Work

In these days of mass production even such adjuncts as chucks feel the urge toward specialization. So it is that there have grown up special chucks designed to meet the unusual needs of a particular case. For example, there have been developed special milling machine chucks and cutting-off machine chucks. These two are similar but they are specialized in that the milling machine chuck is designed for exceptionally accurate work, and the cutting-off chucks are of unusually heavy construction in keeping with the heavy bar work done with them. And in both of these a long even grip is provided by extending the jaws considerably below the face of the chuck as well as above it.

Then among the specials are chucks for holding emery wheels during the dressing process. Here leather pads are used on the jaws to prevent chipping of the wheels and there is provision for keeping the injurious emery dust out of the gear mechanism.

Another special chuck which may be mentioned because it suggests the variety of features which may be incorporated is a gear-holding chuck which is adjustable to the extent that gears of either an even or an odd number of teeth may be accommodated with precision.

Turret lathes, too, frequently call for specially designed chuck equipment. The endurance required for this work is largely provided by careful attention to the design of the gearing, for frequently it is this which first shows signs of breakdown.

Then among the special designs are two-jaw chucks for odd-shaped work. Generally the jaws of this type are removable and tooled out to the exact shape of the piece to be machined.

Another way in which chucks reflect the demands of the modern production world for even greater speeds, is the development of air-operated types. These find their greatest use where the actual machining time is small and the chucking time relatively large when done by hand wrench. Then it is that there is a great saving by the mere moving of a hand lever or the pushing of a foot treadle. The air pipe is small and so may be placed entirely out of the way, nor is the air cylinder obtrusive.

Better Built Chucks of the Vise Type

Along with the development of chucks for rotary jo has gone the bettering of design of that other branch the chuck family including planer chucks, drill pre vises and milling machine vises. Modern chucks of th type now satisfactorily overcome the difficulty of old designs in that the work will not raise off the bed whe once clamped. To make them even better servants of t

(*Continued on page 90.*)

not advertised in this issue write Industry Illustrated

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Look to Your Tool Grinding for Additional Economies



No. 12 Grand Rapids Tap Grinder. Capacity No. 6 to 3" Taps.

Perhaps you are now using the finest of cutting tools to maintain low production costs. But even those cutting tools will not stay sharp forever. You must grind them—grind them in a way that is commensurate with their quality.

GRAND RAPIDS TOOL GRINDERS are scientifically designed—designed to put a sure and lasting edge on every tool. They are rigidly built with the definite purpose of maintaining their ability to grind correct cutter angles with unfailing accuracy.

When you install GRAND RAPIDS TOOL GRINDERS, you take a decisive step toward better tool maintenance, higher cutting speeds, decreased rejections, less grinding, and a marked reduction in the frequency of tool breakage.

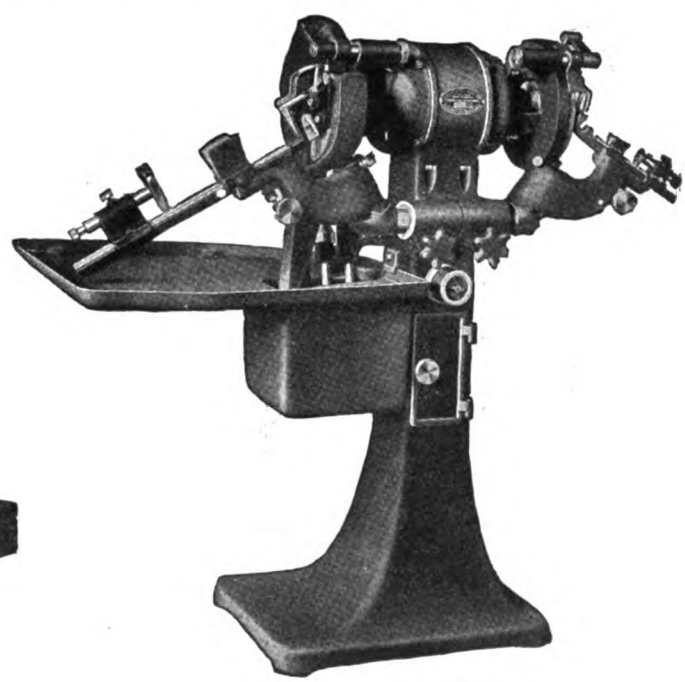
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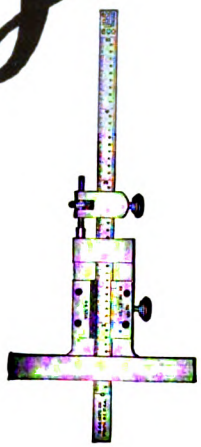


Style C-6-A Grand Rapids Drill Grinder. Capacity No. 52—2½" Drills, also Style D-6-A Capacity to 4" Drills.

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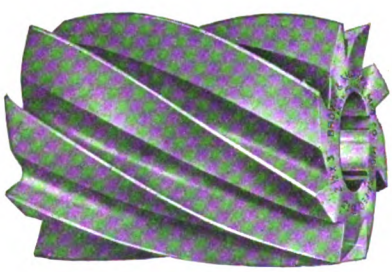
Get Good Shop Equipment In This Period

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Brown & Sharpe Cutters and Hobs go a long way in keeping down production costs by giving uninterrupted service for long periods of time. This long life and ability to stay sharp without frequent sharpenings are the results of the design, the careful steel selection and the heat treatment which only thorough knowledge of cutter requirements can give. Brown & Sharpe Cutters and Hobs give the lowest cost per cut.

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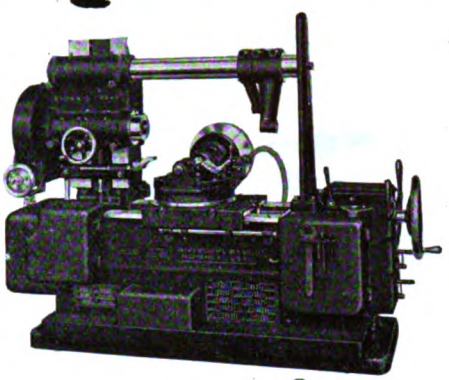
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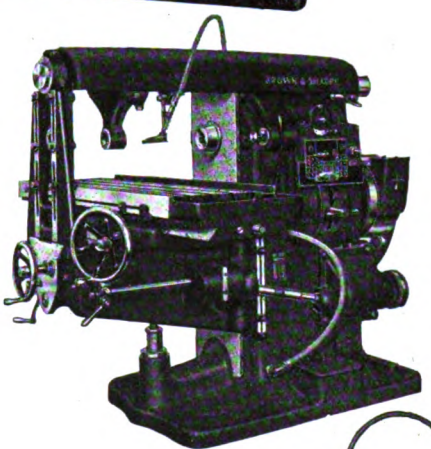
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Cut Production Costs of Keen Competition

Milling Machines
Grinding Machines
Screw Machines
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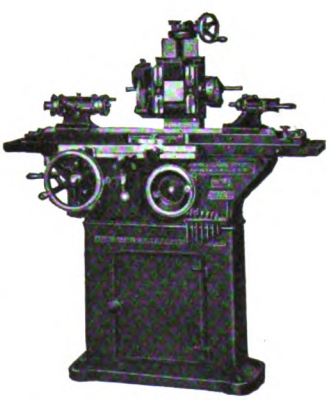
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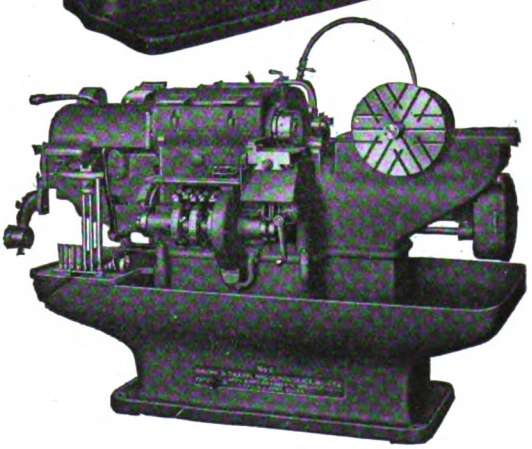




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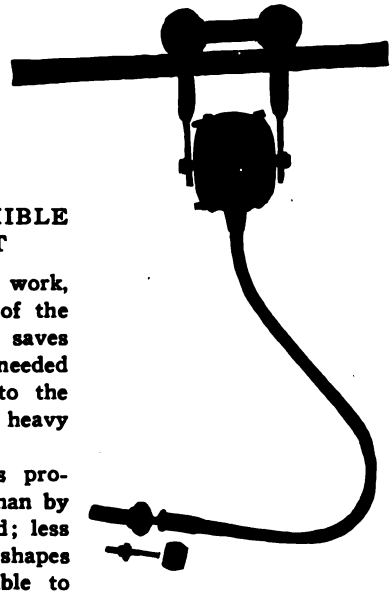
ARPE TOOLS

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THE BIAX FLEXIBLE SHAFT UNIT

takes the tool to the work, leaving the weight of the drive behind. This saves the time and labor needed to take the work to the machine or move a heavy tool.

A better finish is produced in less time than by any previous method; less current is used and shapes difficult or impossible to work on with other equipment are handled with ease. Biax Units are guaranteed for one year—ball-bearing throughout.

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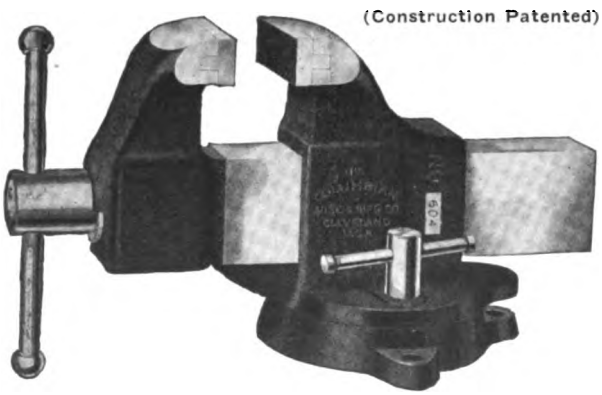
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COLUMBIAN

MALLEABLE IRON MACHINIST VISES

(Construction Patented)



Malleable Iron has twice tensile strength of material used in ordinary vises.

Removable heat treated tool steel jaw faces.

Hardened steel front bearing washer.

Greater depth of throat.

The Columbian Vise & Mfg. Co.
Cleveland, Ohio

(*Continued from page* 86)

production man, they are designed in a number of styles to allow of a variety of adjustments to accommodate the different classes of work demanded of them.

As an example of adaptability, take the drill press vise. When one set of holes has been drilled the vise can be turned on its side and another set drilled exactly at right angles without reclamping the work. This is possible because the base and sides of the vise are carefully finished at right angles with one another.

Now we come to a place where the "tail wags the dog." The chucks so far described have been designed to hold the work. But with drill chucks the chuck holds the tool and not the work. However, there are present the same requirements—a strong grip, accuracy and endurance. Too frequently all three of these requirements are not met, but should be if the production man is to get full advantage of the modern designs of thoroughly progressive tool manufacturers.

Whether it be a small drill chuck or a large chuck for heavy duty turret lathe work, first cost is not the major consideration. Continuity of service over a long life is of vastly greater importance. It is not the cost of a broken part that matters, nor even the cost of replacing it, but the lost production while the machine is down, and interrupted production schedules can very soon mount to a large figure.

And right along with this consideration is the further important one, from the production viewpoint, of selecting the one best type of chuck for the job in hand.

How to Protect Belts Exposed to the Weather

By L. M. Jordan

BELTS of any character quickly damage from exposure to rains, fogs, sleet, etc. However, it is sometimes desirable or necessary to employ their use in unsheltered places. These belts can be protected from such conditions by a cover made from half of an iron drum, as shown in the illustration.

After cutting such a drum in half, rivet two strap hinges to one of the drum heads, and attach these hinges to a support beside one of the pulleys in a position such that when the drum is turned down, as shown in the photo, it will cover the pulley. Thus the belt may be reeled or wound up on this pulley when not in use or during overnight periods and the half-drum turned down over it as shown, the rounded surface of the drum running the rain off the belt and pulley and the heads and sides preventing blowing rains from blowing water diagonally onto the belt.



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MEETING THE DEMANDS *of the tool room*

With ALOXITE AA



GRINDING WHEELS

TO meet the exacting requirements of tool room grinding and to give a greater production of more perfect work The Carborundum Company offers to industry, the Aloxite "A A" Wheel.

In tool room practice, men and machines are today called upon to work to close limits of tolerance; to get a high grade of finish and to grind without unduly heating the work.

To produce a wheel that would fill the requirements of the tool room has taken long and patient research and experiment. But here it is—the Aloxite "A A" Wheel.

An aluminous abrasive—Aloxite—that has greater sharpness and just the proper degree of toughness or temper—a method of bonding that helps make possible a fast, free cutting wheel—these are the things that give to this "A A" Wheel its outstanding characteristics.

It is a wheel that responds readily to both light and heavy cuts. It does its work without creating undue heat. It keeps sharp longer and holds its shape, requires much less dressing. And you can always depend upon a uniform duplication of these wheels in grit, grade and structure.

Aloxite "A A" Wheels Should be in Every Tool Room

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are three notable examples of the rapid forward strides of the sandpaper industry.

A trial order for these products will convince you of their merits.

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Holmesburg, Phila., Pa.

Abrasives for Every Purpose

The Real Test for Drills, Reamers, Taps and Dies

(*Continued from page 26.*)

and straight with the work, for any side movement will break the tap.

It is an interesting fact that, only one fundamental change in the design of taps has been made during the last 30 or 40 years. This is known as the "gun" tap and it is distinguished by the long curling chip which it produces and which comes out of the hole ahead of the tap. This is accomplished by having the cutting edges at the point of the tap ground at a carefully determined angle. Of course, the great advantage of this is that it gets rid of the chip and is especially advantageous on hard tapping jobs.

In so far as they both are used to cut threads there is a real similarity between dies and taps. Cutting edges should have a slight relief to insure accurate lead in both tools and when it comes to the matter of accuracy and correct design for a particular piece of work it's just as necessary to apply specific knowledge in one case as in another.

Collapsing taps and automatically opening die heads have several advantages which are worthy of consideration. In these types the cutting is done by chasers. The point is that when the thread cutting has been completed the tool may be rapidly withdrawn, eliminating the risk involved with solid tools where the thread may be spoiled when backing off because of the pressure of chips. Time is saved and the operation of sharpening is facilitated because the chasers may be removed for grinding.

Keep Threading Tools Sharp

This grinding is very important in all threading tools. How often this should be done depends on the material, thread, speed and other considerations peculiar to each job. It is poor practice and poor economy to work chasers or other thread cutters until very dull. Frequent light grinding or touching up will result not only in better work but in much longer life for the tool. Grinding must, of course, be accurate and should generally be done on the face. Some manufacturers have placed on the market grinders designed for this sort of work and their use is about the only way to insure the necessary accuracy.

As anybody can see by looking in a manufacturer's catalog there are a great many different kinds of reamers, each designed for some particular kind of work. It is of course essential, if the most economical results are to be secured to use the proper tool for the work in hand. If there is any doubt as to what should be used the only sensible thing to do is to consult a reliable manufacturer. There is really very little excuse nowadays for using the wrong kind of tool because just as many data have been gathered and just as much research work has been done on reamers as on drills.

The same is true with regard to maintenance. For instance, straight fluted reamers, which are made with eccentric relief, should be sharpened by grinding on the face of each flute in order to retain a working size as long as possible. Information such as this is given in the better manufacturers' catalogs whenever a particular type of reamer calls for some particular kind of care.

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FORGED TYPE HIGH SPEED DRILL

Stays Good to the Last Inch



You spend thousands for modern efficient machinery. Your executives spend hours in careful consideration over its selection. Don't thoughtlessly limit its production by not using equal care in the selection of tools.

The economy of a production tool is fairly measured by the quality and quantity of the work it does.

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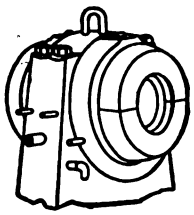
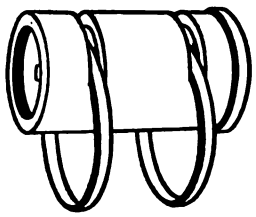
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If Magnolia Metal can give such results in these severe operating conditions, think how it will improve the bearing service in your own plant.

Order a quantity of Magnolia Metal and try it in your most troublesome bearings. You will soon see the advantages of standardizing on it.



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When to Use Power Bench Tools

(*Continued from page* 32.)

the method of securing the tool. The motor for the drill is equipped with chrome-nickel steel gears. The drill has a three-jaw, screw-back chuck for straight-shank drill-bits; trigger-switch; removable combination breast plate and spade handle. It is used for drilling either metal or wood. Its capacity is 5/8" in steel; and 7/8" in hardwoods.

Coming to wood-working machines there is, on the market, a portable electric hand saw, capable of work hitherto limited to fixed tools. A motor large enough to drive an 11-inch circular saw is part of its regular equipment. The unit is compact, weighs 24 pounds, and is operated from the ordinary electric light socket. The cutting time for a 4-inch by 4-inch timber has been computed to be less than 2 seconds. Roughly speaking this is twenty times as fast as hand work. Contractors and builders of concrete forms are finding the new saw particularly useful; but it has found extensive use in industrial concerns for making and shipping boxes and crates. Plant maintenance departments are using this saw for cutting channels in wood floors to carry conduit.

Bench machines can speed up operations in any carpenter shop and eliminate much of the inaccuracy and irregularity of hand work. To this is added the advantage of being able to handle, in any emergency, that which would otherwise have to be done at some other mill. One line of portable and semi-portable machines can do almost any kind of woodworking right on the job. The accompanying illustrations show some of these tools in action.

The band-saw, rip-saw, jointer, planer and post-drill, any one of which can be carried by hand and set up on a convenient bench, are capable of doing all the work required by most pattern shops. In fact, with the portable swing saw shown in one of the illustrations they would be able to supply the mechanical processing requirements of ordinary wood-working departments.

Special Motors for Bench Tools

Motor-driven machinery spells economy, for it means rapidity of handling, and reduction in overhead. The latest addition to another kindred line of equipment is the new arbor-saw, seen in an accompanying illustration. It is equipped with a 30-inch by 34-inch table fitted with removable throat plate to allow for the use of dado-head and grooving-saws. A dial with graduation and a pointer indicates the exact position of the table at all times. The machine is operated by a special motor built by the manufacturer which operates from a lamp socket. This machine has been demonstrated to be capable of rapid production. The pedestal is so constructed that the machine is conveniently portable. Ripping and cross-cut gauge may be used from either side of the table.

The recent development of the bench type of wood working machine has opened so many possibilities of time and labor saving, in the industrial plant, that it is difficult to make a complete survey of their uses and possible uses. One of the organizations developing the field in research in the application of bench type machines, makes saws, lathes, jointers, planers, and sanders for all round

(*Continued on page* 96)

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TRIMO

The Pipe says to TRIMO:



"Hey, Trimo, how come that your teeth are always so sharp? That bite you gave me yesterday clamped as tight as the first one you sank in my hide five years ago. That's a wicked jaw of yours. Who's your dentist?"

TRIMO replies:



"It's a gift, old top, but I'll let *you* in on the reason. That jaw of mine is renewable—see! If my molars get dull or worn, somebody just slips a new jaw in my handle and I'm as good as new. That's why you tough customers around here always get a move on when I get a strangle hold."

The Workman has his say:



"That inserted jaw business is a great thing, all right. Trimo handles last for keeps and jaws cost only a little, so I'm satisfied. You can always trust a Trimo—*but get what you ask for.* Trimo for mine!"

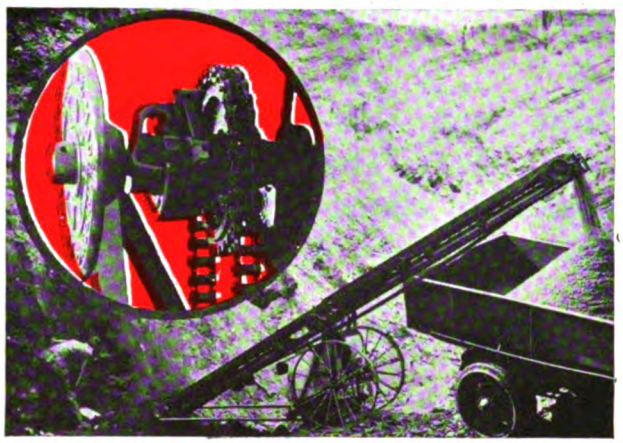


MEMO:
When a man asks for a *pipe wrench,*
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This Portable Machinery Company, coal conveyor, like all handling equipment of this type, requires constant stopping and starting.

But the Conway Clutch, even under these conditions, gives smooth operation, in spite of jars, shocks and loss of power. Conway Clutches perform efficiently, dependably and continuously under the most varied conditions on a variety of machines and equipment.

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(*Continued from page* 94)

shop use. Their new portable lathe has proven one of the most popular types of their equipment. It is powered by a ¼-hp., 110-volt, 60 cycles, single-phase, alternating current motor. It has a maximum swing of 8 inches; maximum swing over tool rest, 6½ inches; face plate diameter, 5 inches; standard bed length, 36 inches, between centers. For control, the lathe is fitted with a snap switch conveniently located near the head stock. The bed is built of heavy structural steel and the tail stock is of heavy construction.

Other types of wood-working machinery in the semi-portable classification are being developed to complete the cycle of all possible operations in the carpenter shop. A table machine, similar to the one described a few lines back, has a supplementary head for drilling holes. By a slight change, the head can be made to take a hollow-chisel mortiser. Sanders offer an easy problem to be solved by the makers of this line of machines, because the operation is relatively simple in itself.

It is, perhaps, only to be expected that bench-type, wood-working machines would be developed more rapidly than those intended for metal-working, since wood offers much less resistance to fabrication. For that very reason, there is still a great deal of room for the development of metal-working machines in this category. The best thought in the machine-tool industry has succeeded in refining fixed tools to a state of perfection unequalled in any other line of mechanical design. Production tools leave little to be desired. At the other end of the scale of metal working appliances are the portables. They have been developed close to perfection. Drills, reamers, screw-drivers, nut-tighteners, grinders—all rotary operations of the light kind—have been successfully perfected.

But there is still room for intermediate machines of the bench-type which will perform the lighter classes of metal-work, wherein the cutting can be done only by real power. Milling and shaping operations, for example. Splining and key-seating have been taken care of. But so far as this writer knows, shaping, boring, broaching and planing, even of small parts, are still left to the fixed machines. There seems to be an opportunity here for the progressive makers of metal-working machines to grasp, to their profit.

Applications of Portable Tools

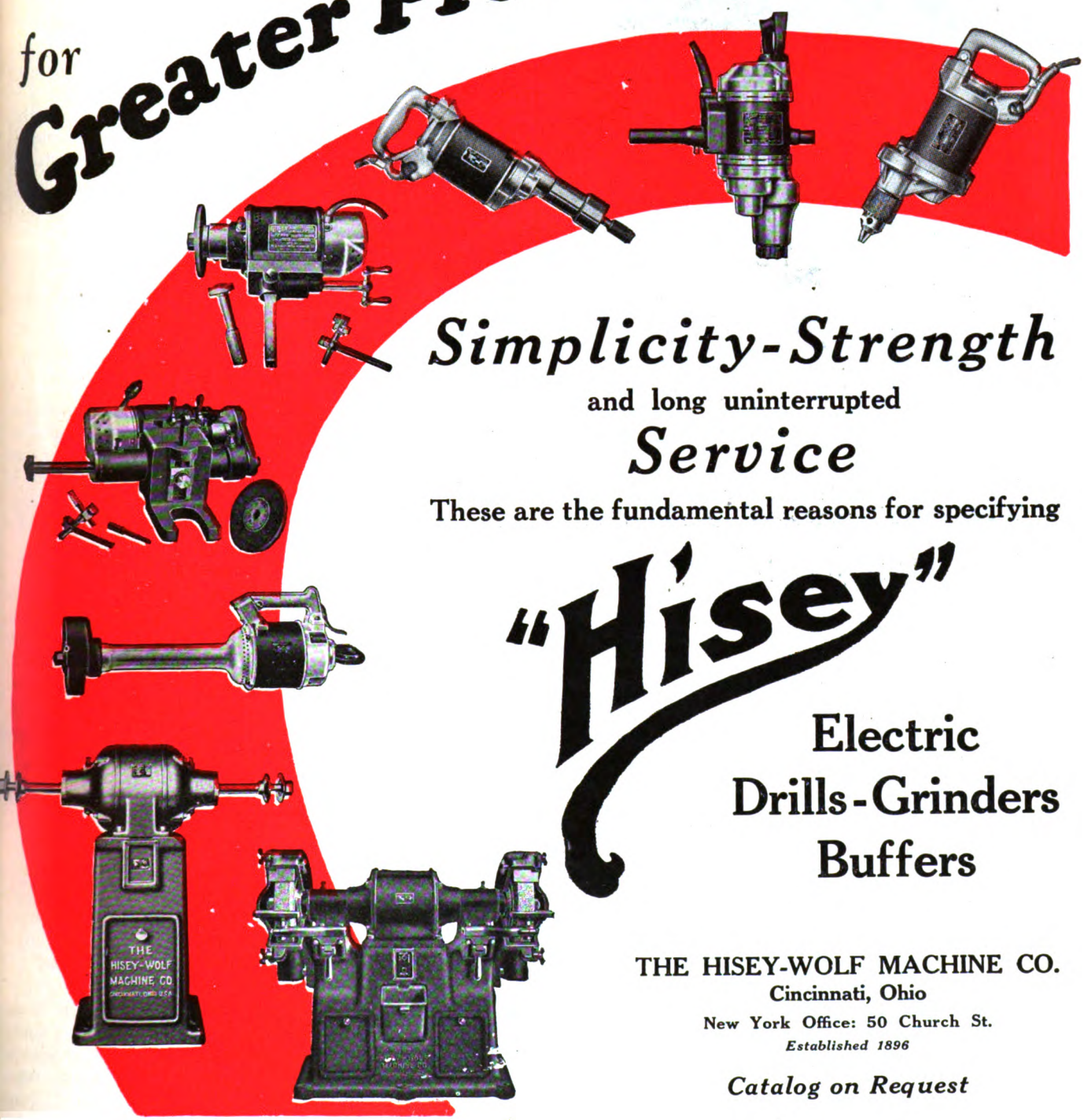
(*Continued from page* 40)

the machine and the additional time lost in taking down are factors that must be seriously considered by a shop manager when he is endeavoring to reduce production costs. Here is where the portable tool has distinct advantages. A gang of workmen, each with a portable tool, can move along a line of unfinished pieces, each man performing his particular operation, two or more men working simultaneously. A sanding operation on automobile bodies, for instance, is a good illustration of time and labor saving of this sort. In another case, a large steel oil or gasoline tank can be cleaned of corrosion and rust by a gang working on scaffolds or ladders in the shortest possible time. It is only a question of providing sufficient lengths of air hose or electric cable.

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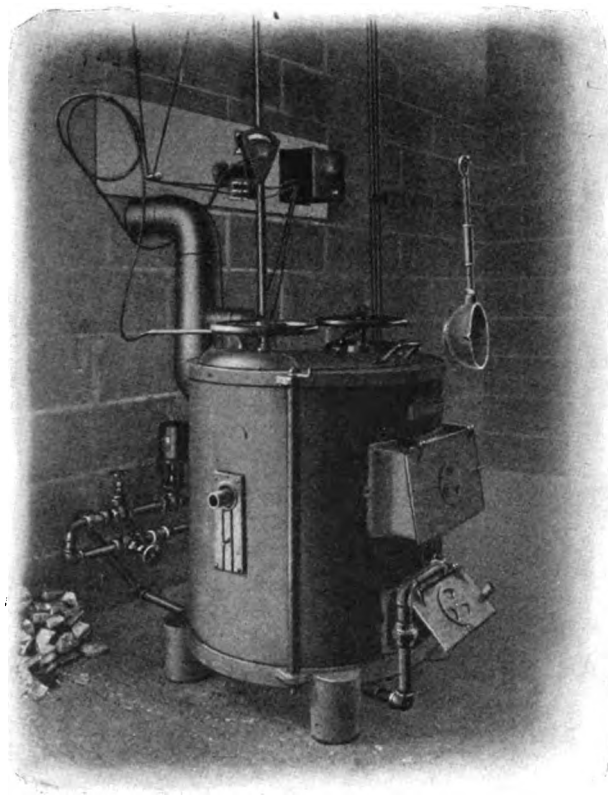
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ROWELL MANUFACTURING CO.
Appleton, Wisconsin

ROWELL

Lengthen the Life of Cutters

(*Continued from page* 52.)

life of the cutter at the expense of production. On the other hand, if the tool is very expensive it may pay to reduce its speed, and consequently the volume of production somewhat, in order to make a greater number of pieces with it than would be possible at greater speed. This, of course, varies in individual cases and the economical rate must be calculated in each instance.

Of course the accuracy with which a piece must be cut or milled also has a decisive bearing on the rate of production, on the type of cutter and consequently on how much it can do before sharpening becomes necessary.

We must not forget that all of these factors which we have discussed have been considered because they determine how much a cutter can safely do before it is sharpened and that by keeping it sharp it is possible to preserve it in such condition that it will give the greatest, or rather most economical, service.

Cutting Lubricants Vary With Conditions

Now there is at least one more item of first importance which has not been mentioned. That is the question of lubricating the cutting surface. Here again experience has shown that a lubricant for one set of conditions is not necessarily right for another set, which may appear substantially similar. For hobbing, lard oil is frequently the right thing to use, while, under other conditions, soluble oil is the most satisfactory, and in still other instances certain of the commercial cutting compounds give the best results. In addition to the mechanical requirements there enters in the ever-present consideration of economy. In some cases the wash of lubricant is so great that it may be economical to use one which makes it necessary to sharpen the cutter at slightly more frequent intervals. Experience is the only way to determine this with reasonable certitude.

Now it is evident from the foregoing that it is impossible to lay down any definite rules of practice which will in any way insure a long life. There is only one thing to do and perhaps it might be called a "rule." That is when any job comes up let the most experienced man available set it up to the best of his ability. He will do better than some one without experience but the more of an old timer he is the less willing he will be to commit himself to any statement until he has experimented. If arrangements are being made to start a quantity production job the greatest care will be justified in the initial tryouts. After a while the time and performance charts will show how much a cutter can do before it should be changed for a sharp one. Perhaps charts from other more or less similar operations will give a good indication of what to expect. At any rate records of this kind are kept by all properly managed machine shops and they are absolutely essential to a degree of control of the operation which will make possible the most economical use of the cutters.

One other "rule" might be given. Always make use of the services available from reputable manufacturers of cutters when confronted with new types of jobs or when trouble arises. They have a fund of specialized knowl-

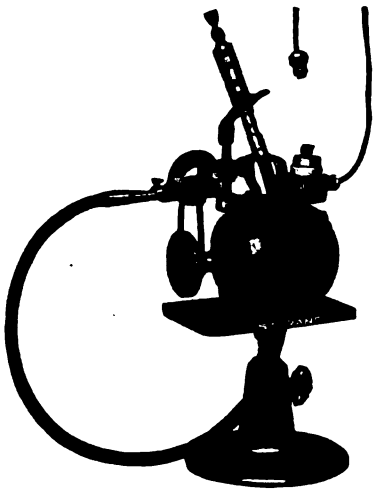
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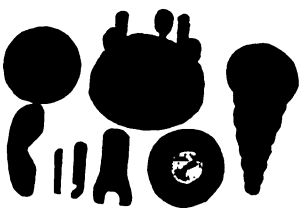
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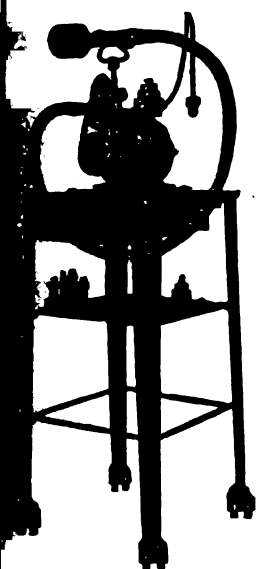
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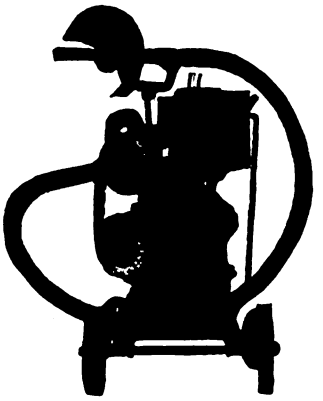
The Machines for Metal Pattern Maker



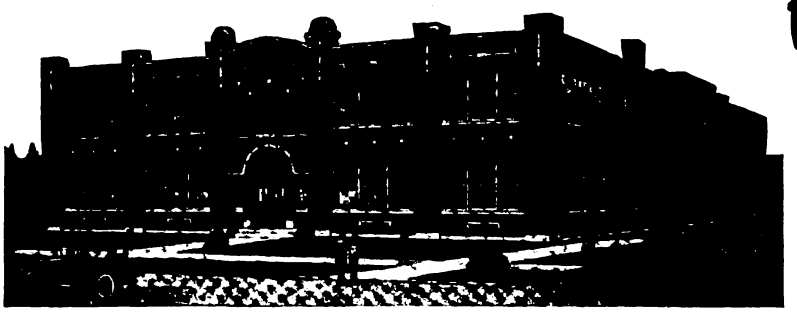
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Machines for General Grinding 1-10 to 2 H.P.



The Three Speed Countershaft attached to motor is distinctly a STRAND idea for the operation of a flexible shaft attached to motor. This was originated and designed by us in 1905.



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No. 2 Automatic Surface Grinder

Grinds Work to
20"x6"x10" Standard
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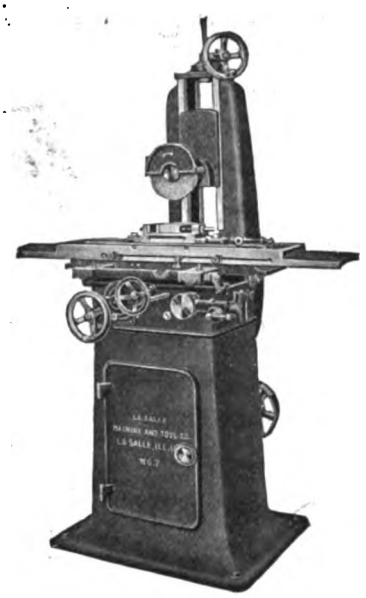


Table travels automatically in both directions. A hand - power table movement can be operated without changing automatic feed.

Also has automatic cross feed in either direction with automatic stop. Wheel truing device is built integral with machine. Price, $550. F. O. B. La Salle, Ill.

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Keep dust out and retain oil



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STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio **Less than 40°**

(*Continued from page 98*)

edge gathered from their own researches and the experiences of users of cutters over a vast range of operations from one end of the country to the other. Of course the tool manufacturers who make the best product, intelligently designed for particular purposes, are very likely to charge higher prices than others. However, it will usually be the economical thing in the long run to procure the best tools and the service that goes with them. An instance comes to mind where the superintendent of a large plant thought he had enough cutters to last him a month or more when the stock keeper called for more. Investigation showed that the last consignment of cutters had been purchased at a supposed saving of about 20% below the usual price. Price had been the only consideration when the purchase was made.

The usual higher priced cutters which fitted in with all the various conditions of the operation in hand gave about two weeks' service. The cheap cutters, which were not designed to fit in with all these conditions, in some cases had broken teeth after two hours. It is obvious how uneconomical that price reduction of 20% turned out to be. The proper balance between all conditions of any operation must be maintained to get the maximum service. One of the illustrations shows how a good cutter, properly designed for its particular job and properly cared for will last until the teeth are almost ground away by sharpening.

Conditioning Cutters Is a Tool Room Job

How and when to sharpen is the final detail of management which must be intelligently handled. In the first place machine operators should not, as a general thing, be allowed to sharpen them. It is the duty of the foremen to see to it that cutters are regularly replaced by sharpened ones at those intervals which have been determined upon as proper. It is not very difficult to institute the routines necessary to accomplish this and it has been done in many plants.

Sharpening should be done by the tool room department. There is only one right way to do it and the right way for one kind of a cutter is not the right way for another. For instance the grinding of the shearing type of cutter must be done in a different way from the grinding of a straight cutter. Some tool catalogs tell how to do this and the manufacturers are only too glad to impart this information, but it is rather too much to expect a tool operator to know all about these details and to become an expert. Besides it is not his job. It is much more to the point, especially in a large plant, to train one or more men how to grind each type of tool in the right way and to make experts of them.

Small Motors

(*Continued from page 46*)

cess of an installation to have the proper motor control.

Makers and users of machines producing or working in clouds of dust and grit need no longer shy away on this account from the motor drive, for this contingency is well met by modern totally enclosed motors. The dust-laden atmosphere is thus entirely excluded from the current-carrying parts of the motor, and fans supply adequate ventilation to compensate for the shutting off of natural ventilation due to the installation of the dust barriers.

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The water-proof test! Will your motor pass it? If you are using Howell Red Band motors you need have no fears.

Under tests like the one shown here, Howell Red Band motors came through 100%—for Howell motors will run for days completely submerged in water.

Double cotton covered enameled insulation—one of many exclusive Howell features—takes care of that.

Won't you let us demonstrate to your satisfaction why we say "give Howell Red Band motors your hard jobs"?

Howell Red Band motors are sold, serviced and carried in stock within easy delivery distance everywhere.

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HOWELL ELECTRIC MOTORS COMPANY
Howell, Michigan

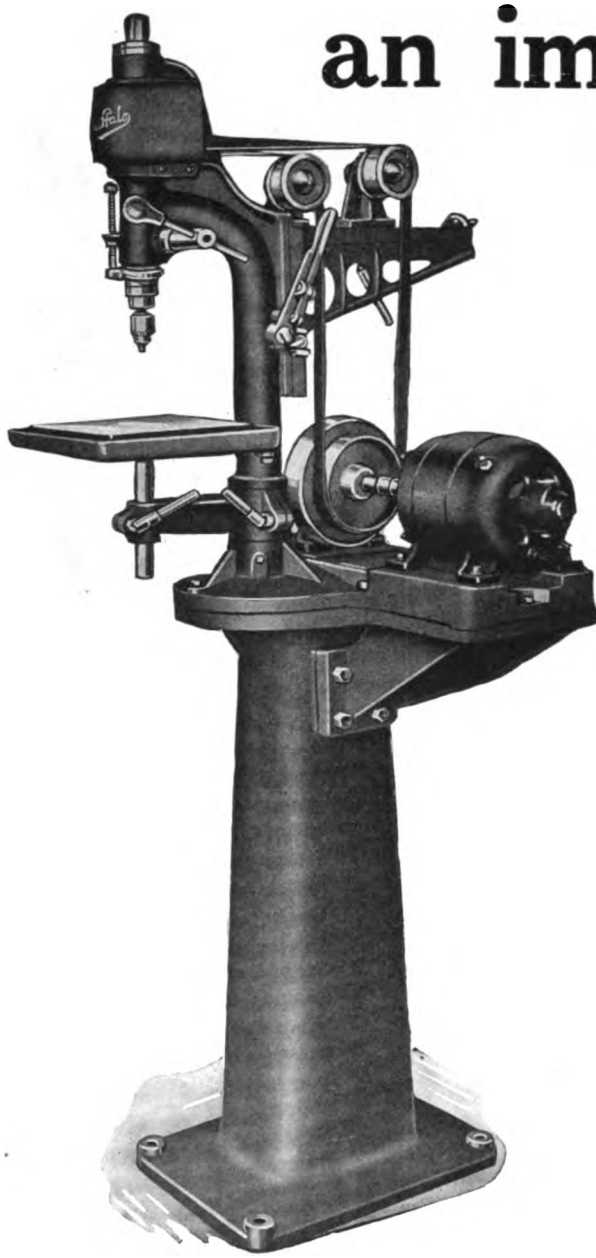
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Howell RED BAND ELECTRIC Motors

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When you purchase "small tools" such as drills, do not let your selection be governed by price alone. Pay the same attention to quality and efficiency as you do in picking your lathes and other large equipment, and enjoy a more efficient shop with fewer replacements.

The New Buffalo 12-inch Hi-Speed Drill

The "Buffalo" Hi-Speed Drill effects big economies in production not only by higher speed but also by increased accuracy and fewer breakages. It enables the operator to get maximum cutting efficiency out of his drills by running them at the correct speeds, for the different materials and sizes. Change from one speed to any other of the four is quickly made by a lever and rapid acting screw. This enables the operator to change to the efficient speed for the work he is performing.

Drilling is faster and safer because it is not necessary to force or crowd the drill. This results in better work and fewer breakages.

Four spindle speeds-3,600, 4,800, 7,200 and 10,000 are quickly obtained by means of lever and rapid acting screw

Buffalo Forge Company

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In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **Production Drills**

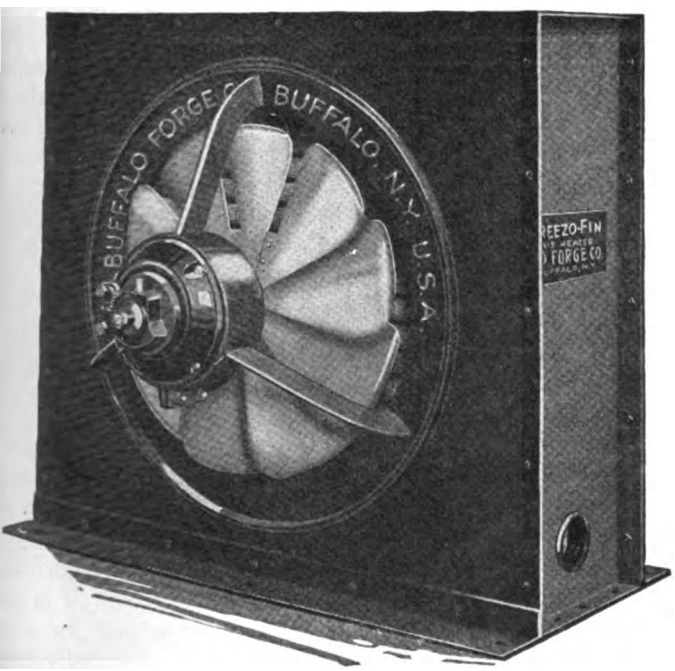
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We have engineering offices located in all principal cities, where your heating questions will be answered to your satisfaction. Why not use this service?

If you do not have a copy of our book "Industrial Heating" write for it TO-DAY.

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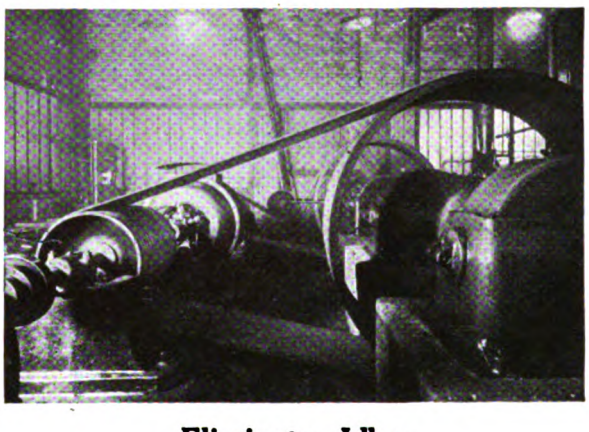
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Eliminates Idler

In the foreground: the new method
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Horsepower—210.
Belt Speed—5000 ft. per min.
Diameter of driving pulley—26 inches.
Diameter of driven pulley—84 inches.
Distance between centers—96 inches.
20 inch Tentacular Tentacular double.

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This is a Tentacular Belt driving a compressor on short centers.

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Ask your dealer or send direct for complete details.

ALEXANDER BROS.
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Makers of Belting Since 1867.

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For products not adve

How to Use Hand Tools

(*Continued from page* 58)

necessary to overcome it the less the wear and tear on both chisel and hammer. As a matter of fact almost all the right ways for doing all of these things are so simple and obvious that they automatically suggest the corresponding advantages from the standpoint of prolonging the life of the tools.

Where heavy cutting is done with a chisel or other heavy work the tool is grasped in the whole hand and held loosely so that it rebounds after the blow is struck. This clears the cut of chips and lessens the fatigue of the workman and makes for good quality of work with the least practicable wear and tear. On all such processes as chipping, pounding, laying out, upsetting, and so forth where a hammer and tool are used the same considerations apply.

Finally it must be remembered that no tool with a mushroomed head is fit for use. Chips fly off and are a danger to the men, they cause a tool to slip or fly out of a workman's hand and cause damage to men, tools and work in an almost unlimited number of ways. From every point of view it is essential that, as soon as a burr begins to appear, it be ground down. The right way of hammering, as already stated, will reduce the rapidity of burring.

Muscular Ease the First Requisite

The sledge is another tool in the hammer class which is used in an entirely different way from the hammer. For instance, when hitting light blows one of the best ways to prevent damage is to keep the end of the handle against the thigh. This keeps the radius of the swing constant and prevents slipping and glancing blows. For very light blows it is held with one hand near the head and with the other hand at the end of the handle. For somewhat heavier blows both hands are near the end of the handle and in both cases the blows are worked from the elbows. For full strength blows the handle is grasped at the end with both hands and the sledge is swung in a circle with elbows straight. On the downward swing the shoulders are brought into play to increase the force but the radius of the swing is kept constant. Skill and proper technique are both essential as it is evident that to miss a blow with such a heavy instrument may cause all kind of danger.

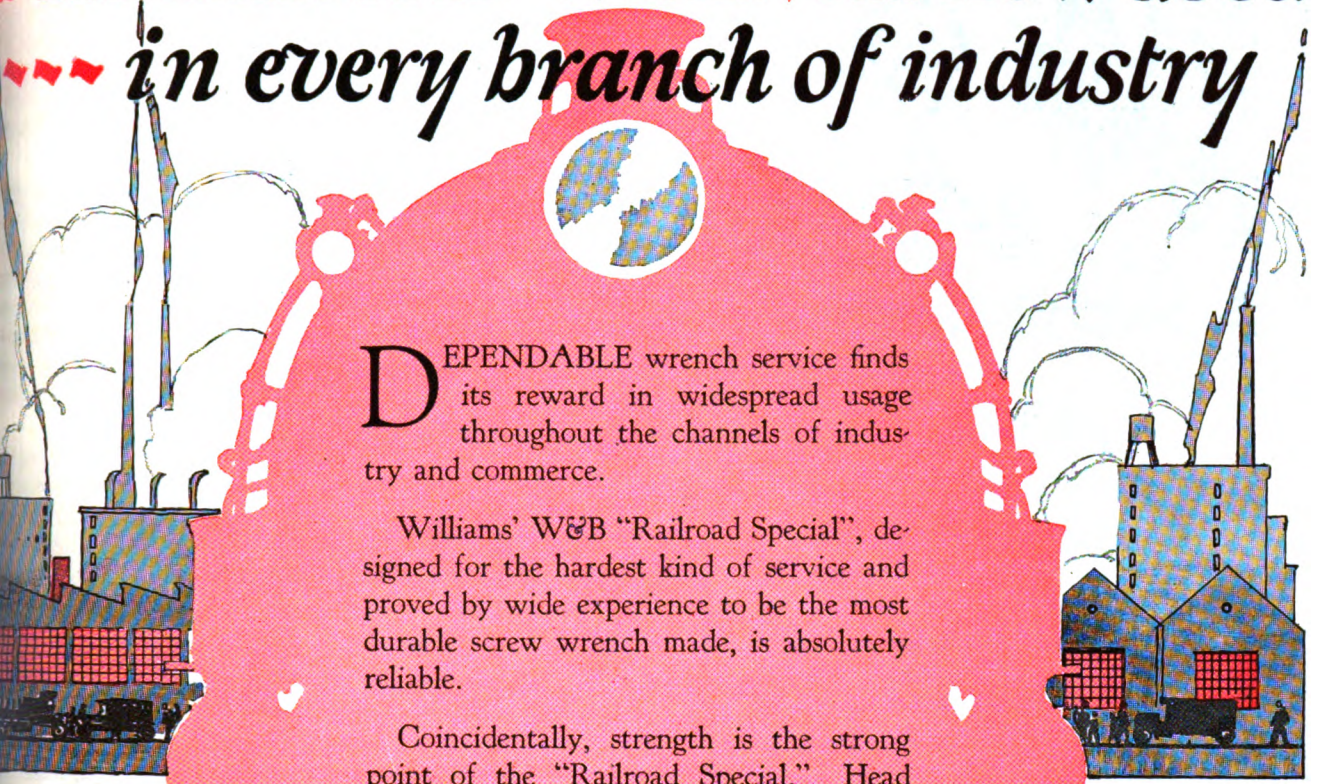
In cutting threads with a hard tool the main thing to remember is that the die or top must be held in proper or otherwise the thread will be uneven and the wear on the tool excessive. With dies there is usually a guide which slips over the end of the rod ahead of the thread. Sometimes a careless workman uses the die upside down and he usually gets a bad thread and injured tool as a result.

Hand drilling is similar to thread cutting in that it is essential to keep the drill in one plane. This can only be done if the breast plate is actually held against the body, leaving both hands free, one to turn the drill and the other to hold the tool by the handle provided for that purpose. If the attempt is made to exert pressure with the left hand back of the breast plate, instead of the body, broken drills and crooked holes are sure

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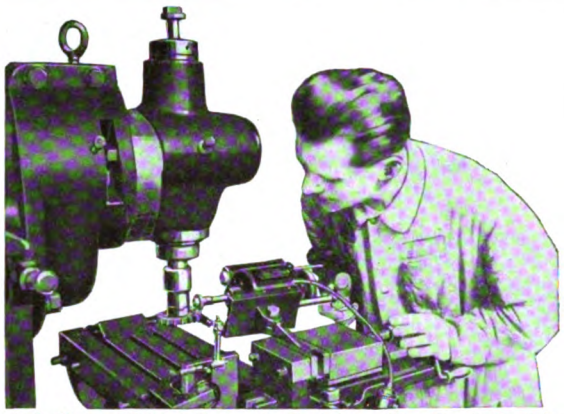
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"W&B" SCREW WRENCHES



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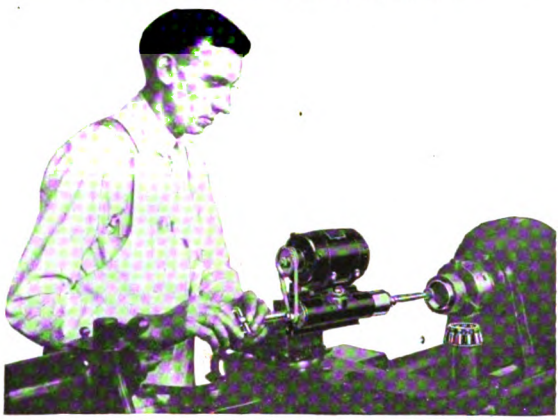
Grinding a Milling Cutter in Position. The Tooth-Rest is Part of the No. 2-AG Grinder Equipment

Adapted to the

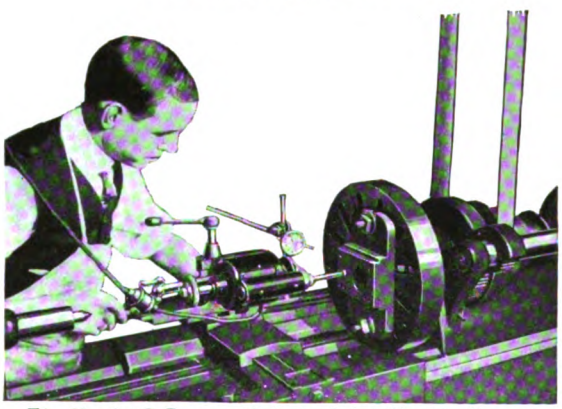
The constant development of new, modern machine tools has given Dumore Grinders an increasingly important place in machine shops, tool rooms and on certain production jobs.

Only a few of the more general applications of Dumore Grinders are shown here. In every industry, wherever machine tools are used, various and ingenious setups have been built around Dumore Grinders, all practical, speedy and profitable.

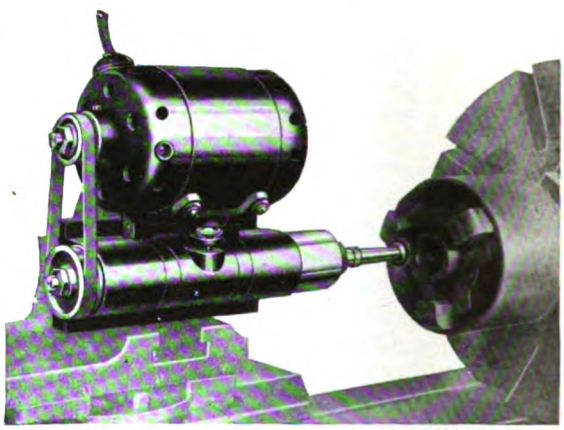
Any degree of exactness required by tolerance limits can be maintained with Dumore Grinders. Every Dumore Grinder is dynamically balanced, there-



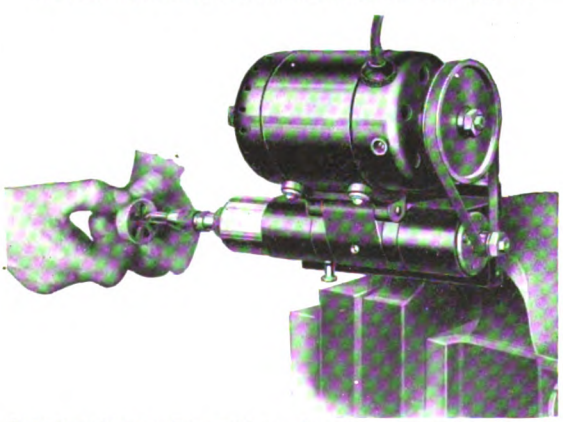
Grinding the Taper in the Outer Race of a Roller Bearing with a No. 3 Dumore Grinder



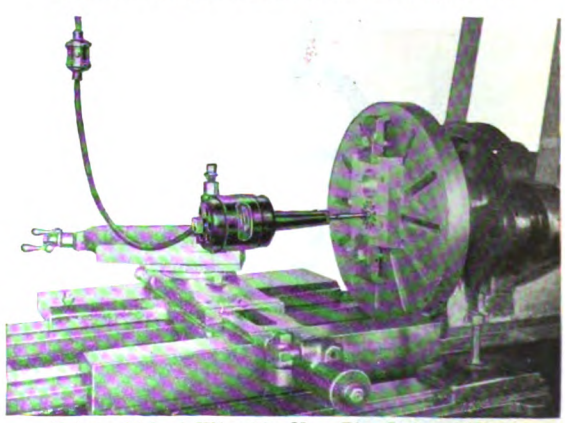
The No. 2-AG Dumore Grinder Being Used to Correct Inaccuracies Caused in the Hardening of a Blanking Die



Grinding the Hardened Jaws of a Chuck with the No. 3 Dumore Grinder to Insure Absolute Concentricity



Grinding Button-Dies with an Emery Pencil in the Chuck Attachment on the No. 3 Dumore Grinder



Using a 3/8 Inch Wheel for Very Fine Internal Work

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Latest Methods

fore vibrationless. Spindle speeds from 3600 to 50,000 R.P.M. are provided. Correct grinding speed without vibration assures accurate work, free from taper, bellmouth or chattermarks.

Various setups and interesting, helpful facts on precision grinding are fully outlined in our new book, "$\frac{1}{10,000}$ of an inch."

Write for a free copy today.

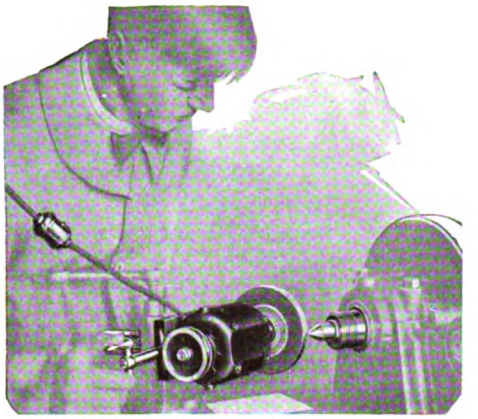
DUMORE

TRADE MARK—REG. U. S. PAT. OFF.

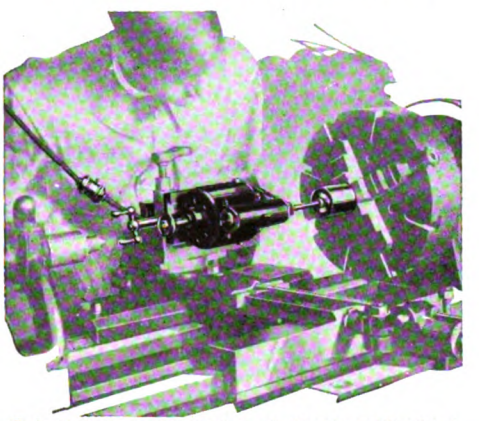
Electric Toolpost Grinders

WISCONSIN ELECTRIC COMPANY

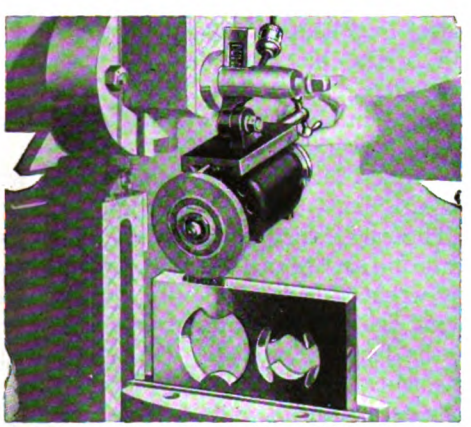
70 Sixteenth Street Racine, Wisconsin



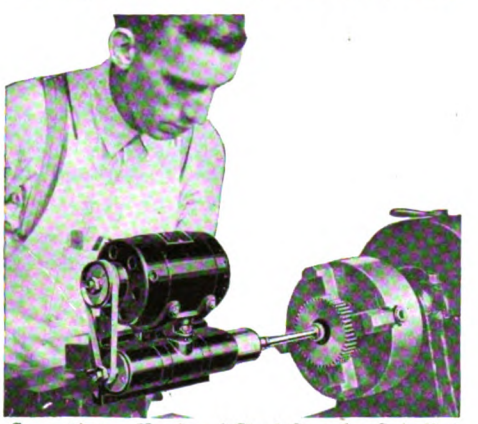
Grinding a Lathe Center This Method of Grinding Insures Concentricity of Lathe Centers



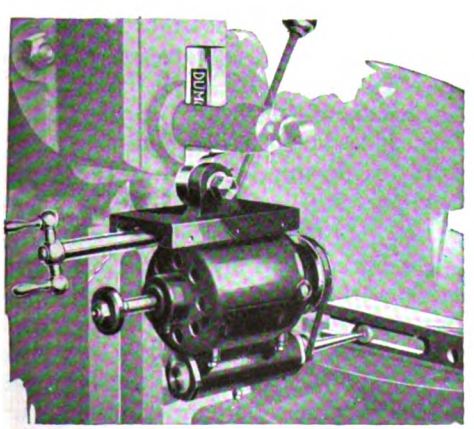
Grinding the Inside Surface of a Hardened Bushing



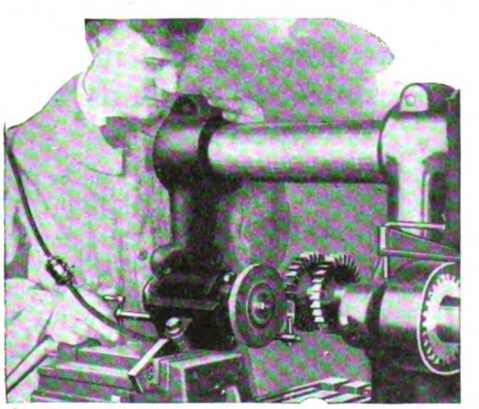
External Grinding to Exact Dimensions on a Blanking Die



Correcting a Hardened Steel Gear by Grinding



No. 2-AG Dumore Grinder Used for the Internal Grinding of a Slot



Grinding a Compound Milling Cutter in Position, Saving Much Valuable Time

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You Can Save Money With a Better File



The Grobet Swiss File Company at Vallorbe, Switzerland, has been manufacturing files for 115 years.

It has been proven that these superior files give greater accuracy and precision for all kinds of work as well as last twice as long as the ordinary file, you can save money by using them. The New York office has a large stock on hand of 2,500 different styles and are able to make immediate delivery.

Write for catalogue I



The Grobet File Corporation of America

3 Park Place, New York City



The GAMMONS helical taper pin REAMER



Reams holes in any metal three times as fast as a Fluted Reamer

Here's a Taper Pin Reamer that can be used in drill press—electrical or air drill.

It will ream holes in metal three times as fast as a fluted reamer. It is carefully tempered—accurately ground and may be run at any reasonable speed with one-tenth the breakage of the best fluted reamer made.

Write for illustrated booklet

The Gammons-Holman Co.

405 Main Street Manchester, Conn.

Who Named the Monkey-Wrench?

By M. M. Gooch

NUMEROUS articles have recently appeared stating positively, but no doubt erroneously, that the monkey-wrench derived its name from that of James Monckey, its inventor. I do not know the source of this information, but the authors must have come to this conclusion only through unreliable hearsay.

Upon reading the statement several times, my curiosity was aroused and I endeavored to learn more about it. I wrote to the editors of various publications and they referred me elsewhere. I wrote to prominent manufacturers of monkey-wrenches and they frankly admitted that they themselves didn't know. I searched through libraries. Librarians made searches for me. But I got nowhere until finally a manufacturer suggested that I write to Frank L. Coes, of Worcester, Mass.

From Mr. Coes, I have obtained information which appears to me to be logical. Much of it is authentic. He himself has done considerable searching in the field both here and abroad to ascertain whether a James Monckey had ever been granted a patent in this field. No trace whatever could be found of the name "Monckey," in any country, as an inventor or maker.

It is claimed that in the early part of the nineteenth century, an English patent was a very hard thing to obtain and therefore little used. It is possible, under those circumstances, that the name "Monkey" is of English origin, but there is no documentary evidence to that effect.

It is true that a patent was issued to a Mr. Monk for the improvement of pipe wrenches, but this is neither the name "Monckey" nor the type of wrench being discussed.

There is evidence that a Mr. Trask wrote Mr. Coes' grandfather late in 1865 to the effect that the term "monkey-wrench" had been in use long before that time. Mr. Trask said he believed the name came with the first use of the English wrench. He suggested that it probably was so-called because you "twisted its tail to make it open its mouth."

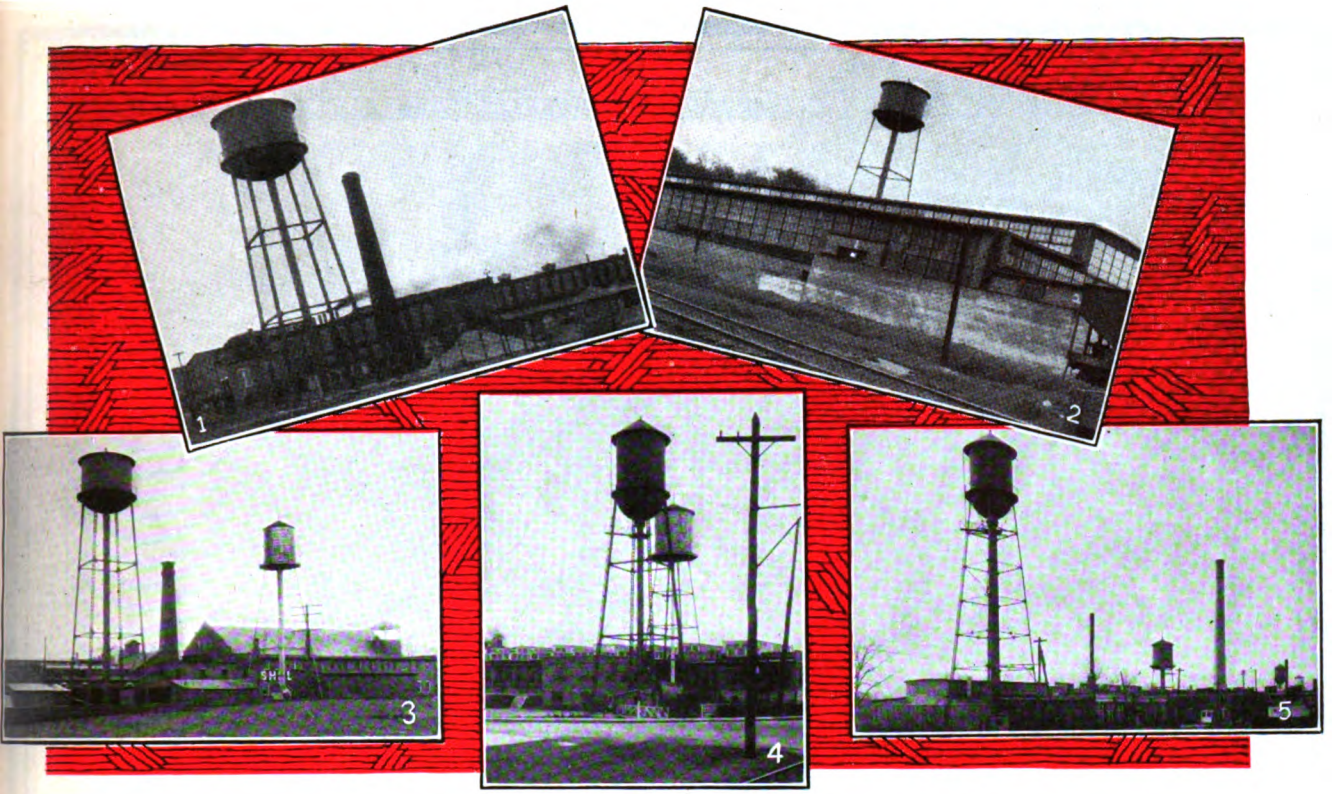
From this material, I conclude that "Monckey" was not the name of the inventor of any sort of wrench, but a term applied to it, possibly for the above named reason. Mr. Trask's explanation seems a plausible one. Mr. Trask was proprietor of the Trask Foundry, Springfield, Mass., at which Mr. Loring Coes worked in 1839-40 or 1840-41 as a gear pattern maker. The above-mentioned Frank L. Coes is the grandson of Loring Coes.

Along with this misconception of the derivation of the name, there has also been a misconception as to how generally the term is used. This particular type of wrench is not universally known as the "monkey-wrench." It is not always sold as such or ordered as such. "Screw wrench" is the name which large buyers prefer. There is nothing definite or universal in such a nickname. In fact, it is not used in the South at all except where there has been, for a long period, an influx of white northern mechanics. In some sections

(*Continued on page* 112)

When writing to advertisers in this issue write Industry Illustrated

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No longer a "Tank Town" But a town of Horton Tanks

IF Shelby, Ohio, ever deserved the "tank town" classification, it was many years ago. Today it is a community of busy industries. In 1897 the city erected a Horton standpipe to provide water storage for the municipal system. This 30-year old standpipe still serves the city's water needs. But adequate fire protection for the rapidly expanding industrial property justified additional precautions.

Three years ago an insurance company engineer made a study of this situation for the leading manufacturers of the city. His recommendations for sprinkler and hydrant installations were universally adopted and in order to make this protection most effective, these plants without exception added Horton elevated storage tanks.

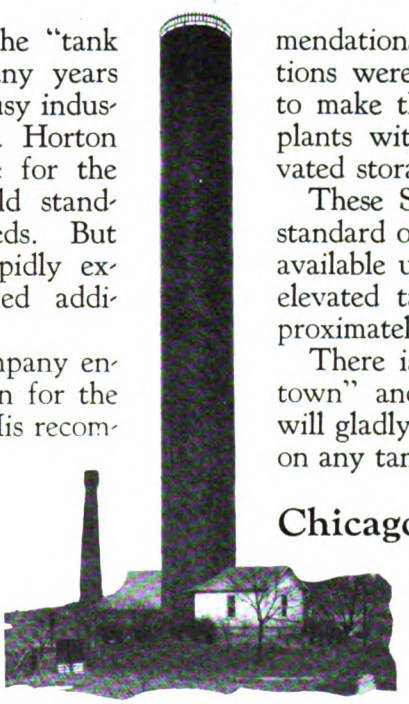
These Shelby industries now enjoy a high standard of fire protection. Water is always available under gravity pressure in their own elevated tanks. Incidentally they saved approximately 50% in the cost of insurance.

There is a big difference between a "tank town" and a town of Horton Tanks. We will gladly give you information or quotations on any tanks your town needs.

The tank installations illustrated above are as follows:

(1) Ohio Seamless Tube Co., 75,000-gallon ellipsoidal bottom.
(2) Shelby Metal Products Co., 50,000-gallon ellipsoidal bottom.
(3) Shelby Spring Hinge Co., 50,000-gallon ellipsoidal bottom.
(4) Shelby Sales Book Co., 60,000-gallon, hemispherical bottom.
(5) Shelby Auto Call Co., 30,000-gallon, hemispherical bottom.

At the right, a Horton standpipe built in 1897, for the city of Shelby, and still serving its needs.



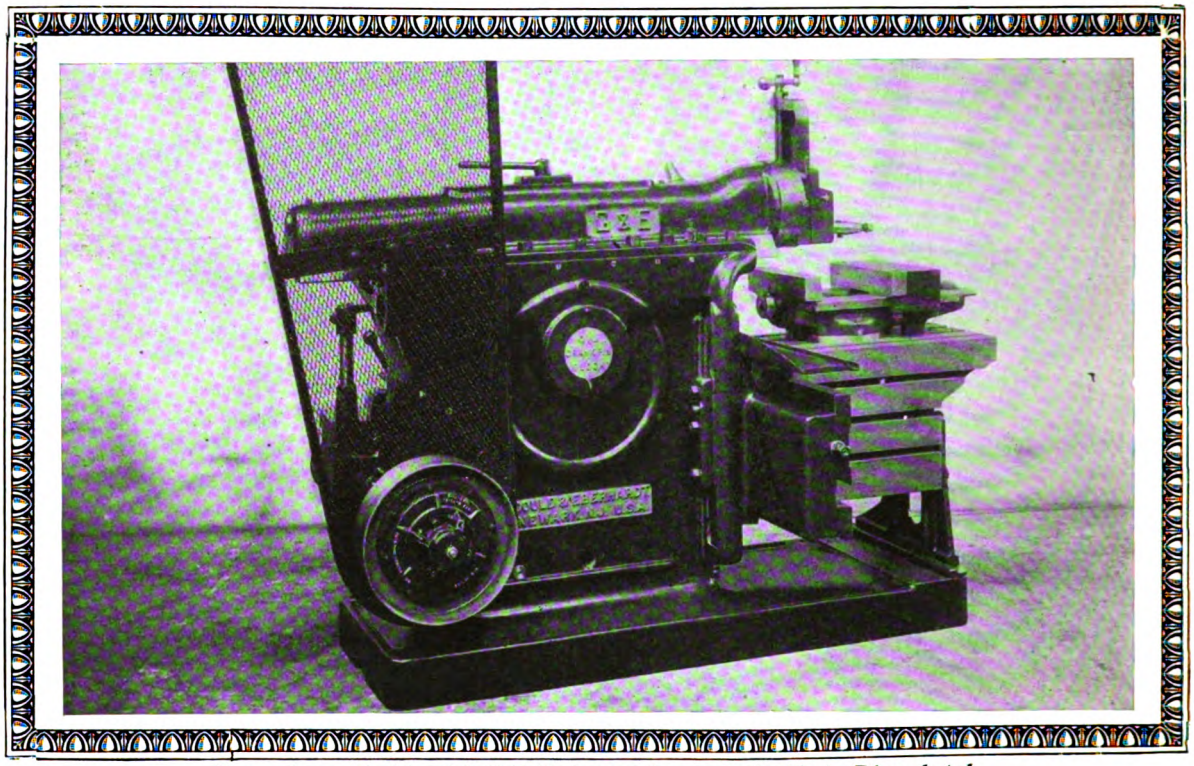
Chicago Bridge & Iron Works

Chicago.....2465 Old Colony Bldg.
New York..3169 Hudson Terminal Bldg.
Cleveland.....2238 Union Trust Bldg.
Dallas.....1658 Dallas Nat. Bank Bldg.
Atlanta.....1023 Healey Bldg.
San Francisco.....1043 Rialto Bldg.
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HORTON TANKS

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Power is applied to this G & E shaper through the Twin Disc clutch.

TWIN DISC CLUTCHES

MACHINE Tools equipped with Twin Disc clutches have many advantages.

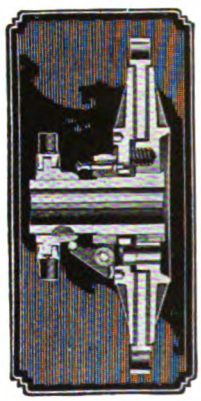
Smooth, even starting, whether under load or not, due to the flexibility of the clutch.

Quick, easy adjustment. Twin Disc Clutches can be accurately adjusted in a few seconds without the use of tools.

Smooth engagement; quick, complete release at the will of the operator or when arranged with automatic stops.

These advantages and the great economy resulting through the elimination of unnecessary counter shafts and belts, help reduce production costs.

Twin Disc Clutches can be engineered into almost any machine tool without changing the machine design. Consult our engineering department.



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Boston (25), Mass.—Standard Auto Gear Co., 531 Columbia Road.
Buffalo, N. Y.—Edward W. Rode, 45 A. Street.
Cleveland—James R. Howell, 6715 Quimby Avenue.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Avenue.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Avenue.
Detroit—Whitney Brothers, 6464 Epworth Boulevard.
Los Angeles—Coast Machinery Corporation, 406 E. Third Street.
New York City—E. George & Co., Broome & Wooster Streets.
Philadelphia, Pa.—Maerky Machine Works, 240 Cherry St.
Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn Avenue.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie Street.
San Francisco—F. Somers Peterson Co., 57 California Street.
Tampa, Fla.—Motive Parts Co. of Florida, Inc., 708 Twiggs Street.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.

TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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"The Power Behind the Product"

Back of the Big Tobacco Plants—Cocheco!

Through the haze of smoke from your favorite brand—consider the importance of tobacco in modern industry—the highly developed, carefully organized business built on the production of a satisfying "smoke."

Big factories in all parts of the country are equipped to produce the perfect pipeful—and here, because the plant equipment is so carefully chosen, Cocheco Belting enters the story of tobacco.

Engineers interested in tobacco manufacture—like engineers in any other line—specify "Cocheco" when they need a leather belt, because it gives the kind of service that reduces operation costs.

We are not claiming that Cocheco Belting makes your favorite brand of tobacco a better smoke, but we do say it probably helps to keep production costs down. The Cocheco "Books on Belts" will show you why.

NEW YORK
CHICAGO

I. B. WILLIAMS & SONS

Dover, New Hampshire, U. S. A.

DETROIT
BOSTON

COCHECO TRADE MARK BELTING

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New! Rapid Production Marking Machines



These machines (one model illustrated) are capable of marking parts such as ferrules for tool handles; electric light sockets, parts of cigar lighters, bronze bushings, spark plug parts, etc., on a production basis at the rate of 100 to 125 per minute. The machines are entirely modern in design, simple to operate and very efficient.

Twenty-five years' experience as makers of marking devices has taught us a great many things about marking methods, some of which may be valuable to you. Consider our factory your experimental laboratory. Send samples of your products and we will tell you how to mark them faster, better and more economically.

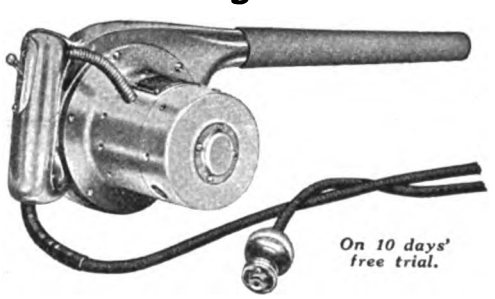
"WELL MARKED MEANS WELL MADE"

THE NOBLE & WESTBROOK MFG. CO.

Makers of Marking Machines, Marking Dies, Machines for Numbering on Metal

HARTFORD, CONNECTICUT, U. S. A.

Ball Bearing Portable Blower



6½-lb. Air Cooled Ball Bearing Motor $45.00 Net

REDUCE your FIRE HAZARD and MOTOR TROUBLES by the frequent use of this "MARVEL" Portable Dust Blower, which gives a continuous blast of DRY air, for blowing inflammable dust our of your MOTORS and other machinery.

Ask us to ship you one on 10 DAYS TRIAL.

This tool is in daily use in several thousand industrial plants and saves its cost every year, several times. Has 20 feet high grade cable and armored plug. Perfectly balanced. Has TOGGLE SWITCH in handle, operated by thumb. Gives 16-in. water column pressure.

Note the Metal Conduit carrying wires from motor to handle.

Motor operates at 10,000-R.P.M. on "NORMA" BALL BEARINGS. This blower is a great time and labor saver, and its mechanical and electrical design gives assurance of a very long life, with a minimum of attention.

Made with UNIVERSAL motors (A.C. & D.C.) for both 110 volts and 220 volts. SHIPPING WEIGHT 18 lbs. Shipped on 10 days' trial, ANYWHERE.

A complete Set of VACUUM CLEANER ATTACHMENTS for $10.00 additional.



Manufactured by

ELECTRIC BLOWER COMPANY

352 Atlantic Avenue
Boston 9, Mass., U. S. A.

(*Continued from page* 108)

they say "spanner" and in others "screw spanner," both of these terms being direct importations from England and Scotland.

Over a period of twenty years, incoming orders were watched by a large concern and never once was the term "monkey" applied to a wrench on a wholesale order. In other words, the term "monkey wrench" is seldom if ever used by people dealing in them on a large scale. In time the name will, at the present rate, be dropped entirely.

Efficiency Topics

By S. W. Frederick

AN engineer who I believe knows more about steam flow meters than anyone else said this not long ago: "It may prove highly profitable to buy a steam flow meter in order to learn that it doesn't pay to use a steam flow meter. For example, if you are using considerable steam in a department and are not sure about the profitableness of the steam, I would install a steam flow meter, find out, and if I learned positively that electrical operation would be better I would throw out all of the steam equipment including the steam flow meter itself, and install electrical apparatus." Thus the steam flow meter would prove to be a boomerang (by eliminating itself). But, isn't that the proper way? That is what this writer calls "good business."

The writer is informed that in the power plant of a prominent industry in Little Falls, N. Y., they had their fireman, engineer, general manager and insurance inspector report on their boilers. Unanimously they reported them clean. That is, they were considered free from scale. However, they were prevailed upon by a tube cleaner salesman to try out a tube cleaner and were surprised to find after using the cleaner, that a clean boiler contained 400 lbs. of scale at the very time when it was pronounced clean.

According to a well known rule relative to the cost of scale, it will be found that 400 lbs. of scale per month is equivalent to a loss of over $400 per year when the cost of coal is $7 per ton. It pays to keep boilers scrupulously clean.

I have before me an advertisement containing this heading: "The way to save coal is to burn all the coal."

While this may sound like good reasoning it nevertheless is misleading and incorrect. It is possible to burn every atom of the coal and yet waste 100 per cent. of it.

If for example a boiler is so thickly coated with scale on the inside and covered with such a thick coating of soot on the outside that heat will not penetrate you can burn 100 per cent. of your coal and waste every bit of it.

Furthermore, if the steam lines are not properly insulated, if there are a great many leaks, if too much air is used in combustion, if the boiler setting leaks, etc., it is very evident that burning all the coal is not going to help much.

The point I wish to drive home is that all factors must be considered, not only the single factor of burning all of the coal.

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Speed + Power

Worcester Polytechnic Institute
Worcester, Massachusetts

DEPARTMENT OF MECHANICAL ENGINEERING

November 30, 1926

Clipper Belt Lacer Company
Grand Rapids
Michigan

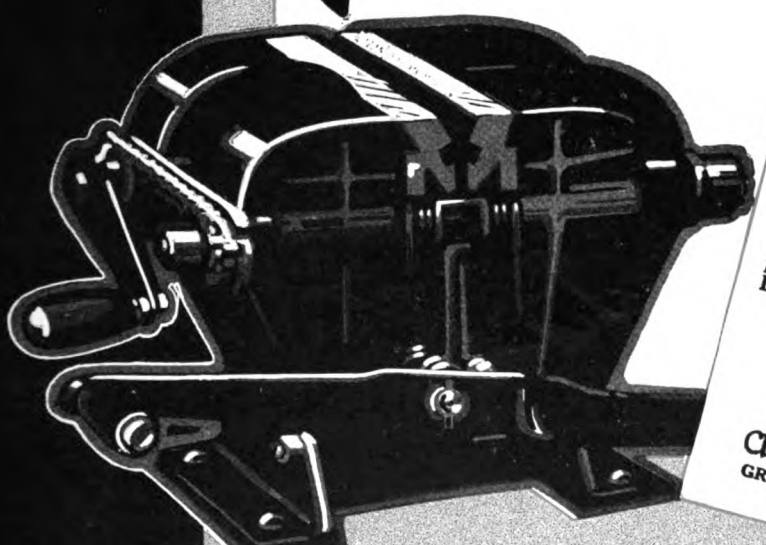
Gentlemen:

A #8 Clipper Belt Lacer of new design tested in our laboratories at Worcester Polytechnic Institute showed that a normal man could exert a jaw pressure of 45,900 lbs. when operating the device with the standard double ended crank.

Yours very truly,

Francis W. Roys

Francis W. Roys
Head of the Dept.
Of Mech. Eng.



45,900 pounds pressure, the weight of six bull elephants, embeds Clipper Belt Hooks absolutely flush with the belt surface.

The New Clipper No. 8 SPEED Lacer laces both ends of any belt up to 8 inches in width in 1½ minutes. One man operates it easily. These three dominant features—POWER, SPEED, EASE OF OPERATION—place the new Clipper No. 8 SPEED Lacer in a class by itself.

Clipper products satisfy any belt lacing requirement.

QUALITY CLIPPER BELT LACING

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

Clipper
No 8 Speed Lacer

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STANDARD





Heavy Duty Grinders
G. E. 40° Motors
4—S. K. F. Ball Bearings
Nickel Steel Shafts
Made in 5, 7½ and 10 H. P.

—

Buffing Lathe
G. E. 40° Motors
4—S. K. F. Ball Bearings
Nickel Steel Shaft
Made in Sizes ⅓ Up to 15 H. P.

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3 and 5 H. P. Grinders
S. K. F. Ball Bearings
Push Button Control

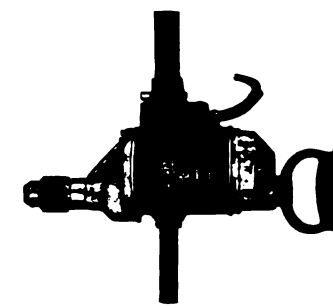
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Universal Motor Drills
Gears Chrome Nickel Steel
Ball Bearings
Made in Sizes ¼″ Up to 1¼″ Capacity

Write for Late Catalog and Discounts.

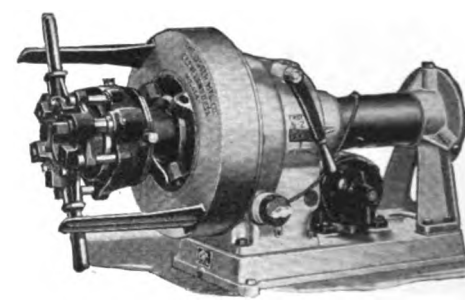
Established 1912



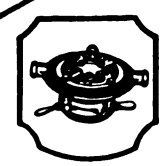


THE STANDARD ELECTRICAL TOOL CO.
Cincinnati, Ohio

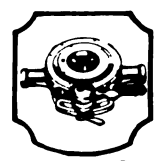
AFTER 30 years of uninterrupted leadership in the field of pipe-threading Oster in the past 3 years has leaped even further to the front with a series of record making improvements that have literally crowded on each other's heels. The latest—a fitting climax to the rest—is described below.



The Oster No. 414 Power Boy



Receding Die Stocks
Three sizes—for 1″ to 4″ pipe.



Bull Dog Die Stocks
In 15 sizes for pipe from ⅛″ to 5″—plain or ratchet type.

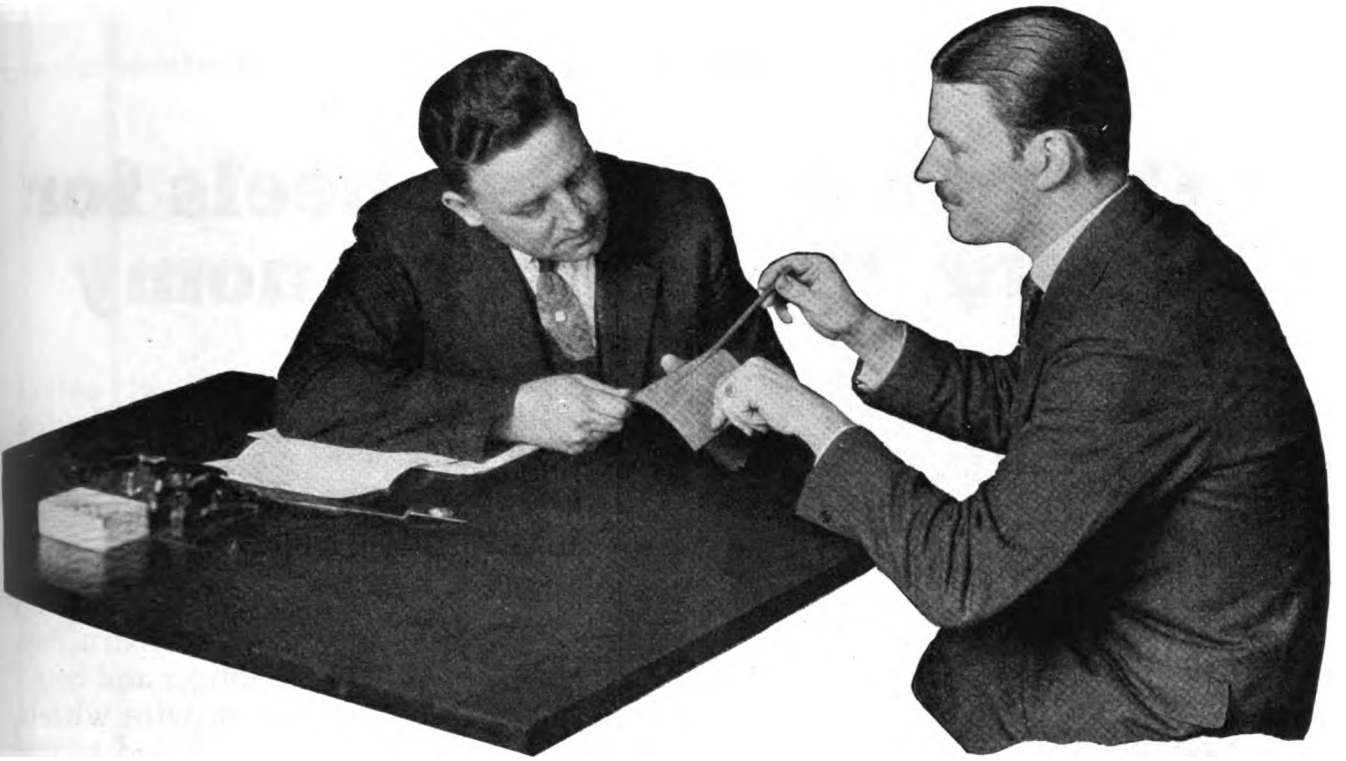
The Heavy Duty Pipe-Threading Machine that's really Portable

PORTABLE—it weighs but 380 pounds—you can take it anywhere the pipe-repairing or pipe-threading job may be. Because it will thread pipe from ½″ to 4″ through the barrel and from 4½″ to 12″ with the auxiliary drive shaft you can thread any size pipe desired on one machine. Its small size—24¾″ high, 20″ wide and 47″ long, two speed control and many other features are explained fully in Bulletin No. 72. Write for it—it will show you the way to new and surprising pipe-threading economies.

THE OSTER MANUFACTURING COMPANY
Manufacturers of the most complete line of pipe-threading equipment in the world
2058 East 61st Place · Cleveland, Ohio

For product advertised in this issue write Industry Illustrated

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"These Belts Stick Together"

(because they are better cemented)

THE laps and plies of Duxbak Belts are noted for their "stick." They do not come apart. The Schieren process of preparing and cementing laps and plies does not allow for failure. All weak fibres are removed by machine. The longest and strongest fibres remaining form a perfect mat for the cement to adhere to. And the cement is tested for strength and pliability. It won't crack and break down. Duxbak Belts stick together.

PLIABILITY

Let us mail you a copy of a new folder on pliability and how it affects belt life.

Name .....
Company .....
Address .....

DUXBAK BELTING TRADE MARK

Chas. A. Schieren Company

Tanners
Belt Manufacturers

31 Ferry Street, New York

CENTER DISTANCES

We are publishing a new authoritative article on center distances. Let us mail you a copy!

Name .....
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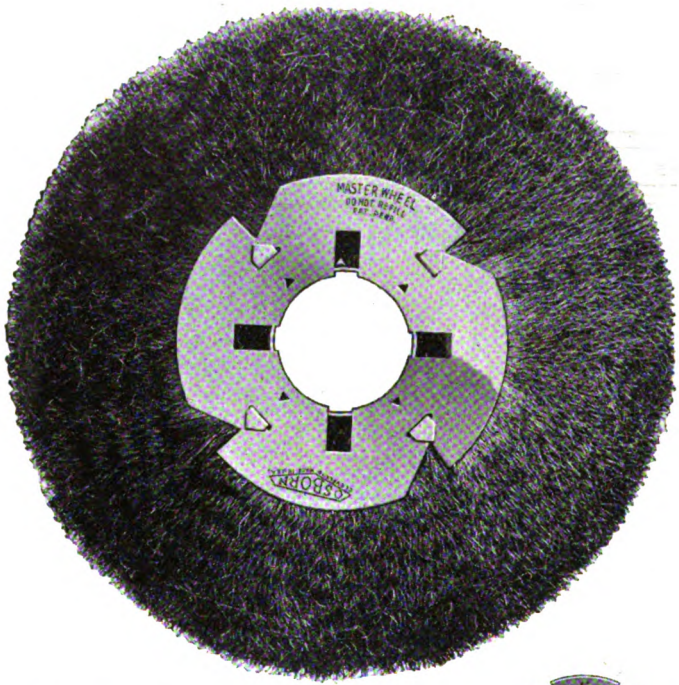
Branches and Distributors in All Principal Cities

DUXBAK WATERPROOF LEATHER BELTING

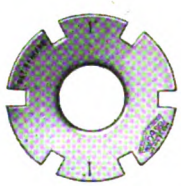
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OSBORN

Osborn Master Wheels for Long Wearing Economy



Master Wheels are made in sizes ranging from 4″ to 15″ in diameter and all sizes have a standard 2″ opening. The adjustment to fit any size shaft is made by the use of Osborn Adapters. A set of Adapters to fit your size arbor will be furnished with each wheel.



Osborn Adapter



Economy Sections are made in sizes from 6″ to 15″. Economy Sections and hubs are sold separately. Arbor hole sizes range from ½″ to 2½″—full list of sizes and details sent on request.



Monitor Sections are furnished in sizes ranging from 6″ to 15″ in diameter and with arbor holes from ½″ to 2½″.

Factories and mills in every part of the country know the satisfaction of using wire wheels bearing the familiar Osborn trade mark.

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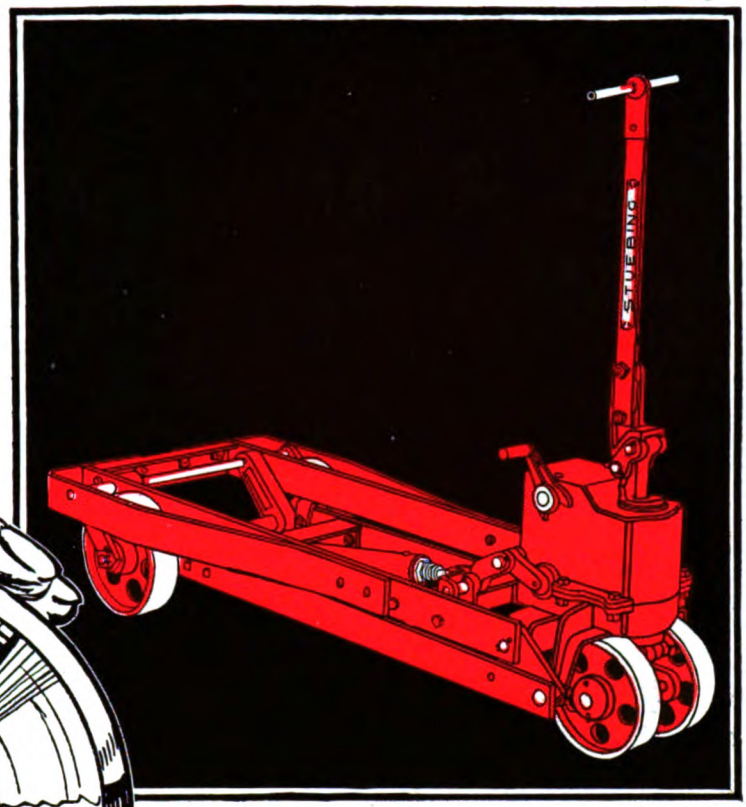
Riehl Sections—The type of construction of these sections, together with the additional amount of wire in the section, insures a longer wearing brush. Sizes 4″ to 15″. Arbor holes any size desired

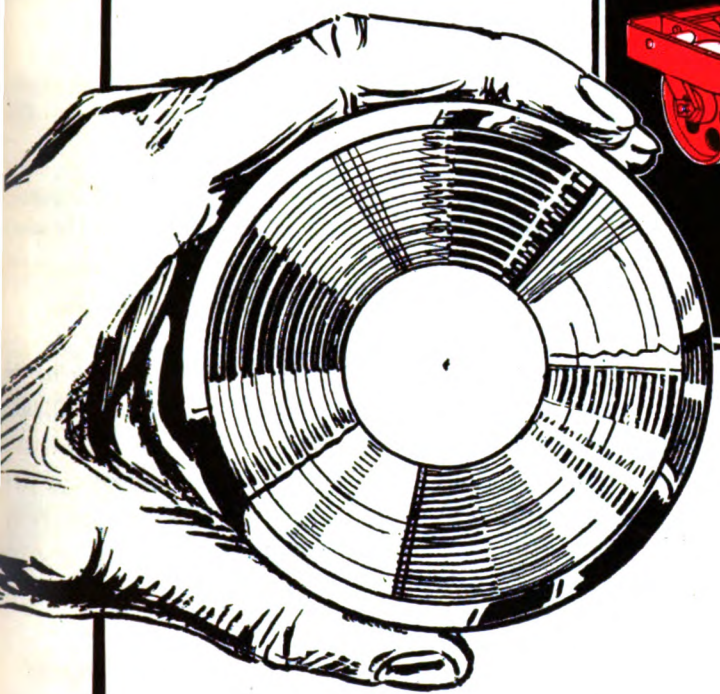
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Inside the Safety Check A Test of Quality Construction

The reliability of a lift truck is in the accuracy—and design—of its hydraulic check. Loads are protected by it. Lives may depend on it. Here again Stuebing-Cowan build regardless of cost. No automotive cylinder is more accurately bored or finely ground than the inside of the 5/8" seamless, one piece cylinder of the Stuebing-Cowan hydraulic check. It HOLDS the oil under tremendous pressure without any possibility for expansion or leakage. It is infinite attention to such important values that accounts for Stuebing-Cowan products being the " Choice of the greatest industries".

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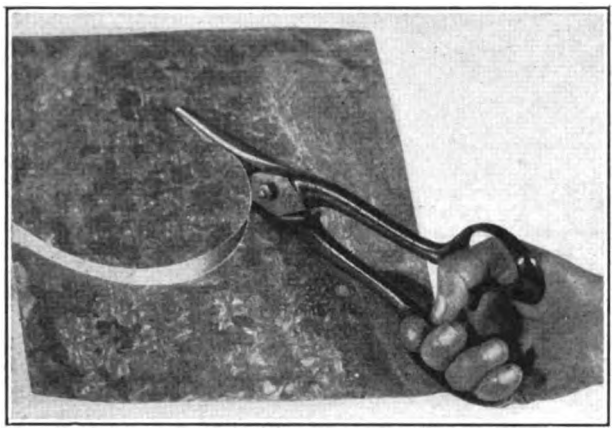
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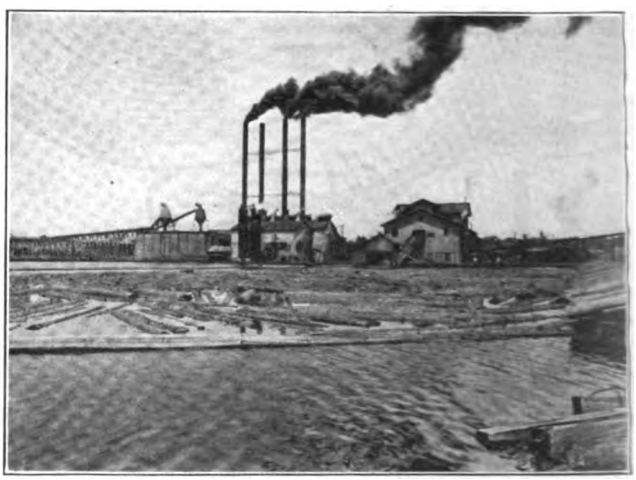
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Mill Waste Proves of Value to Whole Community

By George F. Paul

IN the operation of any large plant, true economy is obtained when waste products are utilized to good advantage. A remarkable illustration of this principle is found in the operation of the mills of the Dierks Lumber & Coal Co., which are located at Dierks, Ark., and Broken Bow and Wright City, Okla. The sawmill waste from these mills may well be said to illuminate the whole countryside, for it is used in lighting the towns of Winthrop, Gillham, Cove, Foreman, Mineral Springs, Murfreesboro, Horatio, Lockesburg, DeQueen, Dierks and Nashville in Arkansas, and the towns of Broken Bow, Wright City, Calliant, Idabel, Talihina, Oak Hill and Albion in Oklahoma.

The three principal power-producing plants are interconnected. As a result of this arrangement, whenever there is interruption in production at one point the users of electricity in these towns suffer no inconvenience, for the current from the other power plants is available. These lines serve an estimated population of 100,000 persons. The 33,000-v. transmission line that joins the three main power houses forms the backbone of the power system. At present there is a total of 185 miles of 33,000-v. transmission lines.



A local power plant had been operating in DeQueen for many years, but the machinery could not be depended on for producing steady power. Such a situation was unfortunate as electricity was used to pump water for daily use in the town. The citizens of the town organized the DeQueen Light & Power Co. to secure the construction of a 27-mile high voltage transmission line from Dierks to DeQueen. This company took over the lines of the local electric company, and a decided reduction in cost has resulted from this new arrangement.

Shavings, sawdust, hogged waste and bark made up the fuel. It is estimated that the fuel has a moisture content of 45 per cent. by weight and a heat value of about 5,800 B.t.u. per pound of wet fuel. Four pounds of this fuel produce a kilowatt-hour. A load dispatcher divides the system load on the different power plants according to fuel available and general operating con-

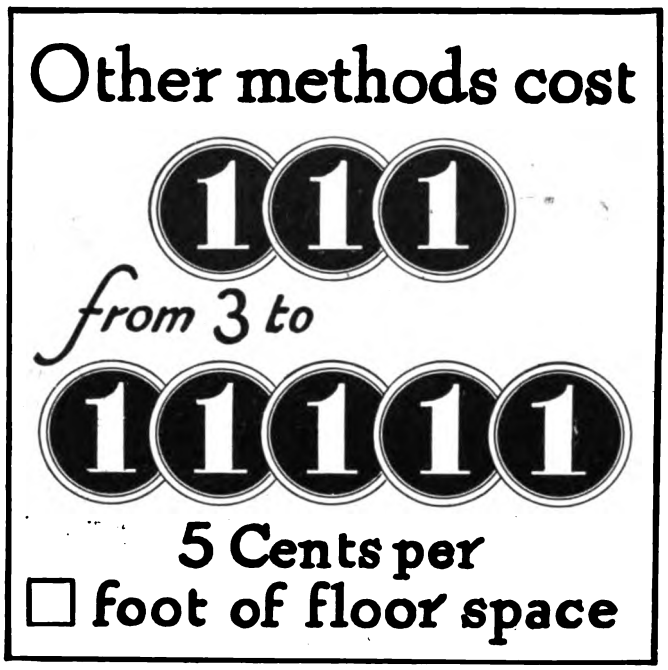
(*Continued on page* 120)

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THE charts above show the first cost of wood floor finishes. Including labor cost, Lignophol is from 50% to 75% lower than staining and shellacing (or varnishing).

As Lignophol is easily applied with a long-handled brush the labor cost is reduced to the minimum. The material alone costs but 1 cent per square foot.

The U. S. Forest Products Service says linseed oil does not protect. Shellac and varnish are surface treatments only and wear off.

Lignophol penetrates the wood, filling the cells and fibres and producing smooth, hard and dustless floors that last for years.

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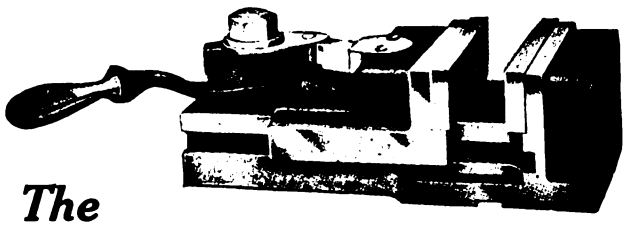
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(*Continued from page* 118)

ditions. Whenever one power house becomes short of fuel, the other power houses are instructed to relieve the situation by taking more load. The mill at Dierks, Ark., which is shown in the accompanying illustration, has a capacity of 150,000 feet of lumber a day. Here are two 750-kw. turbo-generator units that drive all mill machinery with the exception of the "shot-gun" in the sawmill, and also supply the transmission lines. At the Broken Bow mill is a 750-kw. generator unit and at Wright City are two generators, one 1,000-kw. and the other 500-kw.

Approximately 450,000 kw. hrs. a month are supplied to towns. This power is used by cotton gins, water pumping plants and others for commercial and lighting purposes. The average lighting rate is 14 cents a kw.-hr. and the average revenue from power users is 7 cents a kw.-hr.

There are other benefits besides the revenue from power sales. Power factor losses have been decreased. Before building the transmission lines, the power factor to all plants was about 75 per cent., causing a large power loss in the cables and lowering the capacity of the generating equipment. Now the power factor of the system has been raised to 87 per cent. By connecting the plants with a transmission line, the total load on all three plants has been reduced 15 per cent. This comes from equalizing the load over the transmission line between plants. When the load on one plant swings to a momentary high peak, the load on another plant is probably swinging downward. The transmission of power between these two plants serves to stabilize what would be a fluctuating load. Furthermore, after 11 o'clock at night, and on Sundays, two power houses shut down and the third handles the load. Formerly, to light the mill towns, plants had to be run 24 hours a day all the time.

Thus the mill waste that proved a useless commodity whose disposal was often a serious problem, has now been transformed into a positive benefit for the whole community, and the work of operating the mills is greatly simplified.

Using the Microscope to Identify the Coal You Buy

By M. E. Clements

THE microscope is being used by chemists of the United States Bureau of Mines in the development of a method by which coal can be identified by the purchaser as coming from a particular bed or formation, regardless of what may be claimed for it by the dealer or mine operator who sells it. The large consumer of fuel may, under this method, have his laboratory staff examine extremely thin slices of coal offered for sale and by identification of the fossil remains in the coal determine whether it is, for instance, from the Upper Freeport bed or from the Pittsburgh No. 8 seam. In the industrial world, it is highly important that coal from certain beds be used for certain purposes, as for coke making, smelting, smithing, or gas making. There has

(*Continued on page* 122)

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One Customer Says:

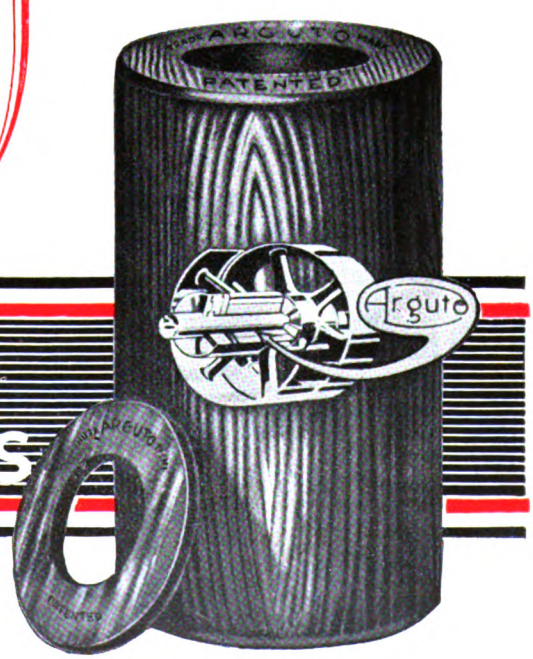
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ARGUTO OILLESS BEARINGS *have gone 20 years without oil or attention*



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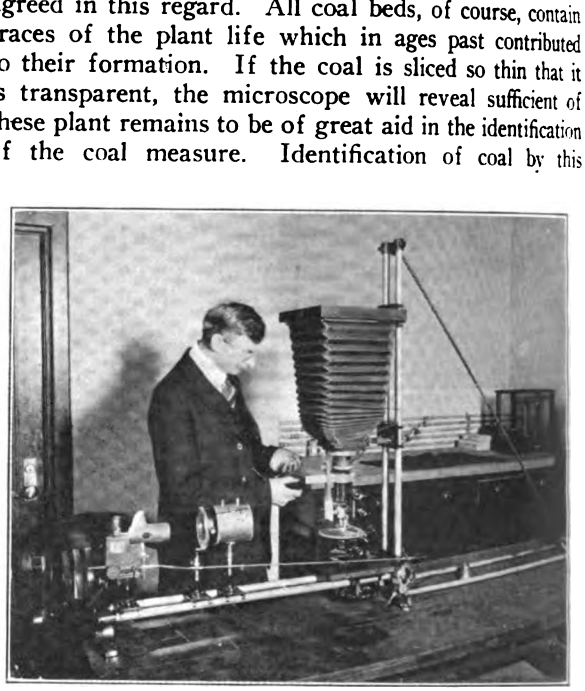
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(*Continued from page* 120)

always been much looseness in the naming of the different coal deposits, and even the geologists have not always agreed in this regard. All coal beds, of course, contain traces of the plant life which in ages past contributed to their formation. If the coal is sliced so thin that it is transparent, the microscope will reveal sufficient of these plant remains to be of great aid in the identification of the coal measure. Identification of coal by this

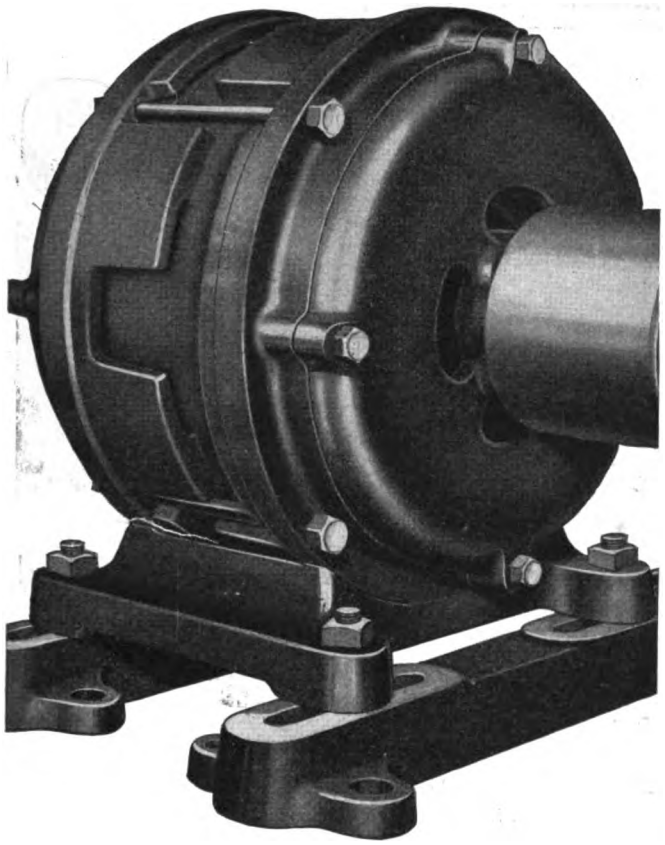


method is hardly practicable for the householder who puts a ton or so in his bin at a time, but the system is likely ultimately to have far-reaching possibilities in the industries where coal is bought and consumed on a wholesale scale.

There has long been need of the working out of a definite system for the identification and correlation of coal beds. The different coal beds have been given a multiplicity of local names, and official geological surveys have not always given the same names to coal beds known to be identical. Such confusion has resulted that many coal operators do not really know just what bed of coal they are mining and selling, while the coal buyer or consumer has no check on the source of his coal.

The history of the carboniferous, or coal-forming, period in the United States may, in general, be considered as a succession of swamps containing luxuriant vegetation. Alternating with the periods of swamp conditions, there were depositions of sediments which buried the swamps. The accumulated vegetable matter in these swamps formed our present coal beds. During the intervals between the laying down of the various coal beds at a given place the coal-forming plants underwent considerable changes. As a result of the changes in the plants, the spores and other plant-remains now found in coals should likewise show differences. Thus the coal itself contains the characteristics in the way of plant remains that enable the identification of the bed.

In studying coal samples for purposes of identification, a block of suitable size is ground and polished on one side to give a plane face about ½ by ¾ inch in size. This surface is dipped in molten paraffin for a few minutes, and the surface cemented to a glass object slide. The block of coal is then ground down to perhaps three 25,000ths of an inch in thickness, or rather, thinness. A cover glass is cemented over the section, and it is then ready to reveal under the microscope the secrets of its origin.



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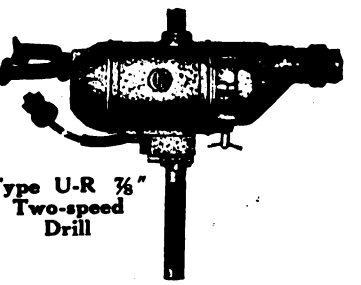
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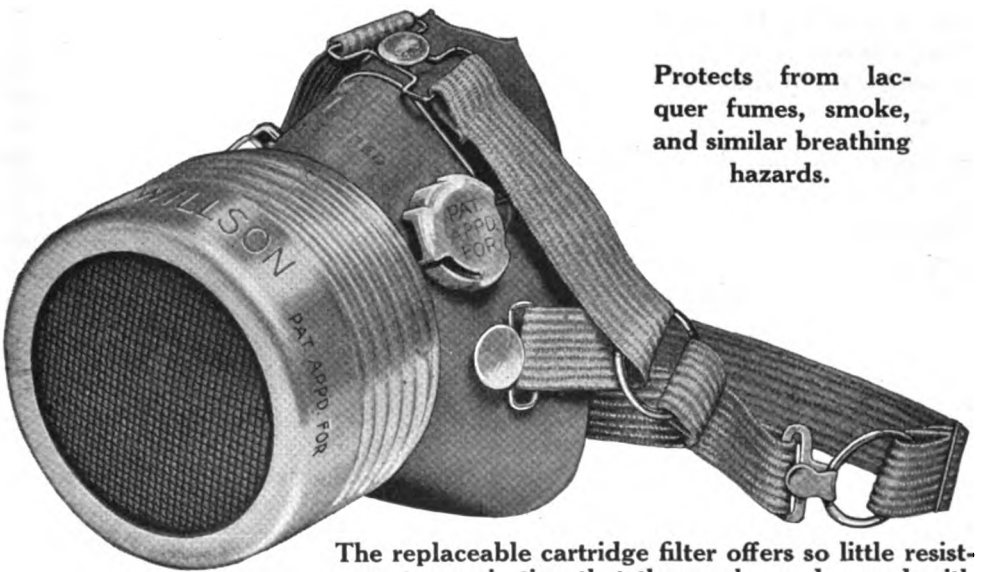
available in both ½" and ⅞" capacities. The speed change is made by a shift of the lever even when the tool is running.

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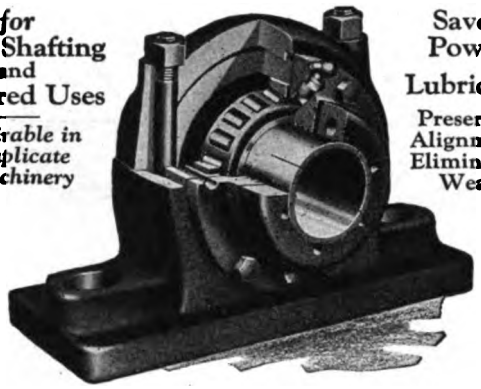
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Smooth bored steel clamping collars make the sleeve thoroughly tight on the shaft—a proved principle of construction. Sleeve threads are eliminated, providing a sleeve that is stronger than one of the same diameter which has been cut into and weakened by threading.

Other appliances in the Medart Timken-equipped Line of Industrial Applications are: {1} the Ball and Socket Hanger for line shafting usage, {2} the Unit Mounting, adapted to use in individual machines, and {3} the Loose Pulley.

This added line makes Medart a more complete source for mechanical power transmitting machinery and allied products than at any time in its nearly 50 years of serving Industry. Ask for Bulletin on Timken-Equipped Line and for Catalog No. 43 on all other Transmitting Equipment.

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Eliminating the Use of Sub-Standard Material

By Alfred E. Waller

NOTE: The following paper, which was read by Mr. Waller, Managing Director of the National Electric Manufacturers Association, at the September first meeting of that body, expresses our views on standardization so exactly, that we are reprinting it in full. It is a well known fact that the electrical industry, with the cooperation of the Underwriters' Laboratories, the Associated Factory Mutual Fire Insurance Company and other fire prevention bodies throughout the country, has rendered an important service to purchasers of electrical material and equipment by setting up standard specifications and by following up the installation work to see that it complies therewith. We dare say that there is hardly one of our readers who, at some time or other, has not had some unpleasant experience in the purchase of materials or equipment (other than electrical) which were not as represented. Therefore, the methods pursued by this progressive body of manufacturers, to eliminate the use of sub-standard material, will, we hope, point the way towards similar action on the part of other manufacturing bodies, both as producers and consumers.
—*The Editors.*

SUB-STANDARD material should never have been permitted to gain a place in our industrial markets. It has no justification, either from engineering, industry policy, or public interest viewpoint. Obviously, it cannot be justified on the basis of engineering merit. It was an unwise deviation, even at the first, and the competition in turning out sub-standard material has caused continued greater divergence from proper standards of excellence. As an industry policy, there is even less justification. The individual manufacturer will testify that sub-standard material invariably makes him do the same work for less reward, because the product of his labor is unsatisfactory. Sub-standard material was originally introduced with the idea that those who brought it forth might obtain a greater percentage of existing business by means of price advantage than they had originally by virtue of their ability to sell standard and approved material. Responsibility for this expedient was divided between new and inexperienced manufacturers trying to enter various lines, and others who did not correctly appraise the economic features of the situation.

The innovation was in no sense an attempt to increase the consumption of a product; it was essentially an attempt to effect a redistribution of existing business. Apparently it was not realized that anybody can, and most people will, manufacture sub-standard material down to the point of making it actually hazardous if they are driven to do so by sufficiently strong unintelligent competition.

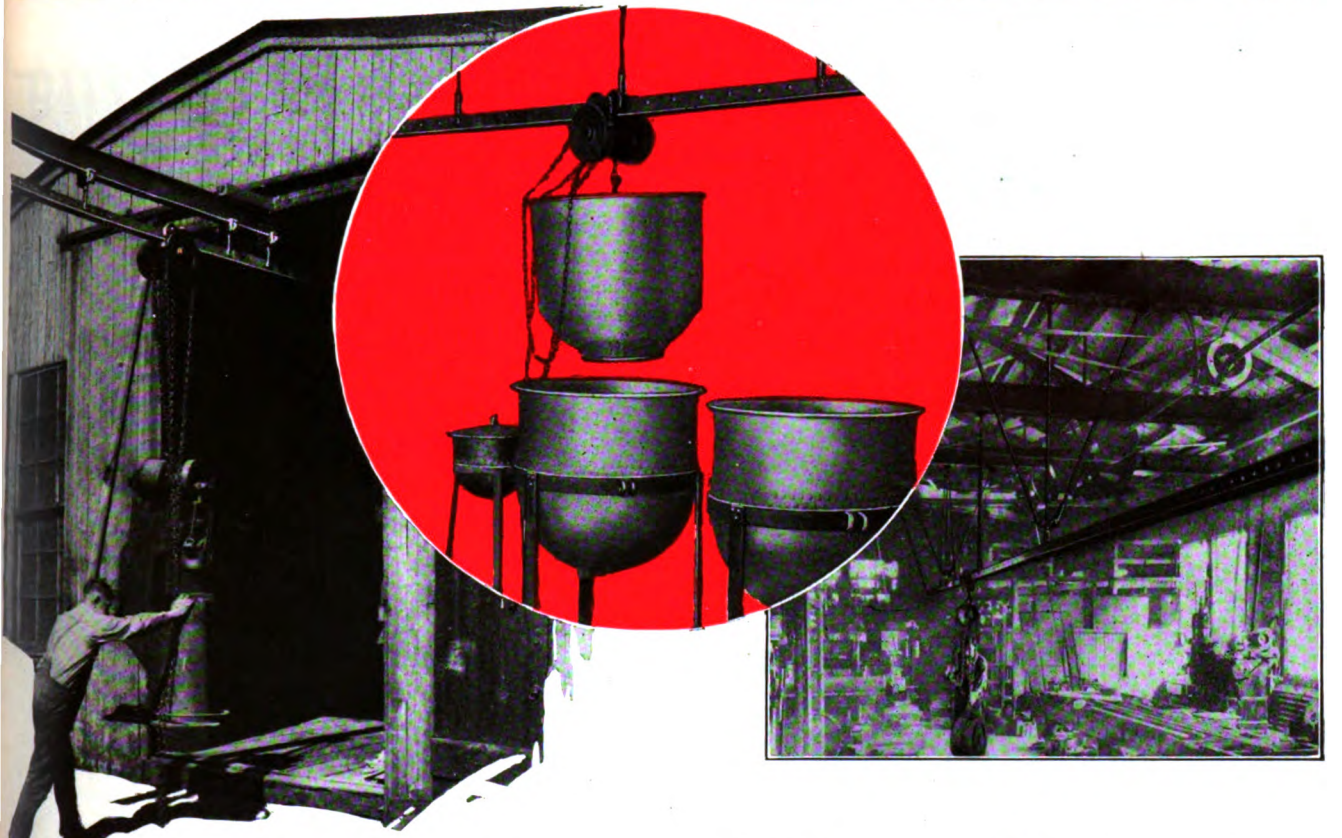
Be that as it may. We are now confronted by the alarming fact that there is a vast amount of sub-standard material produced; the effect of which is to deteriorate the manufacturer's market, increase his contingent liabilities, multiply his manufacturing expense and cost of distribution by increasing the number of types of material handled and finally, most serious thing of all, break down the confidence of the public in the quality and character of electrical material and of the manufacturing group which produces it.

What is the objection to discontinuing the manufacture of sub-standard material at once and immediately? It has no defenders, it has no justification. Everyone would be glad to see the last of sub-standard material under one condition; namely, that everyone should stop making

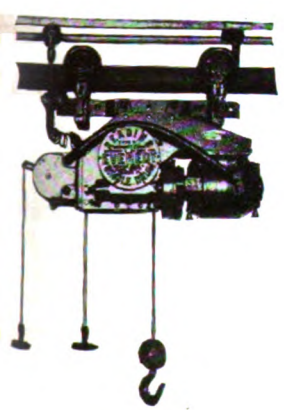
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from Fruit Juices to Heavy Castings



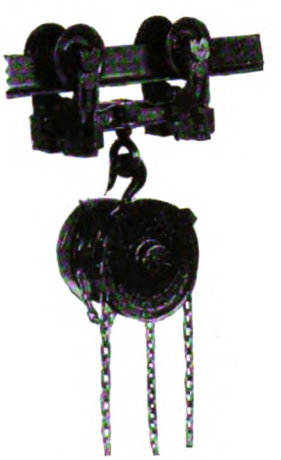
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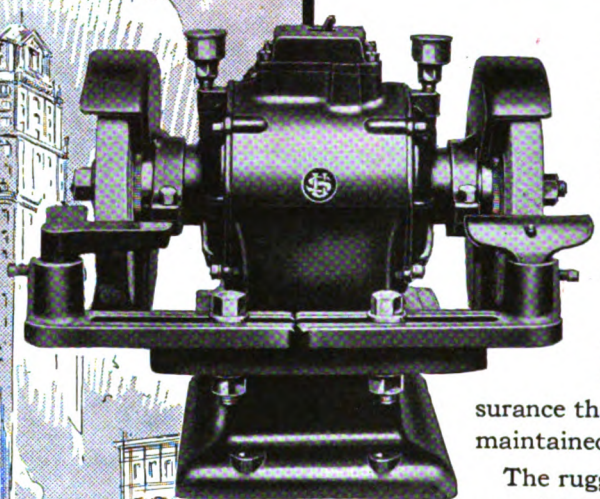
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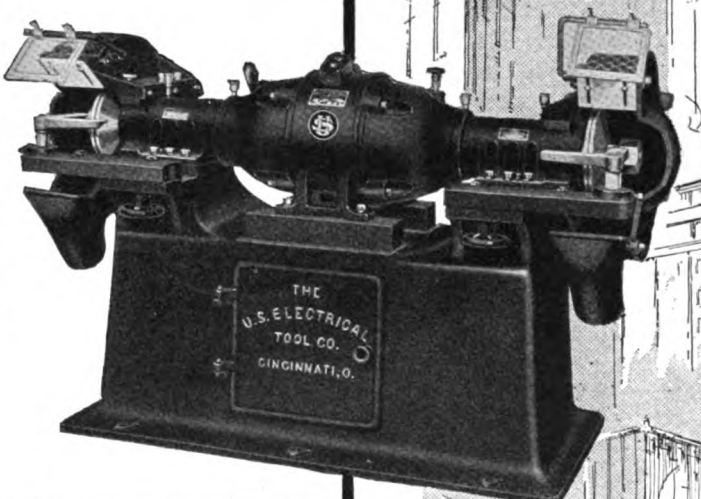
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THE STANDARD OF QUALITY
1897 · 1927

U. S. Adjustable Speed Grinders maintain a speed of 5500 feet per minute, approximately, even down to the flanges, no matter how worn the wheels become.

This means less time out for wheel changes and fewer grinding wheels per year.

This is one of the patented features of a U. S. Grinder. Others are: Exhaust connections on wheel guards; positive shaft-locking device for holding shaft while replacing wheels, etc., etc. Get all the facts before you buy. Ask your jobber, or write us.





ELECTRICAL TOOL CO.

ixth Street
Ohio, U.S.A.

U.S. Portable Electric Drills Grinders–Polishers

Export Sales Department—Westinghouse Electric International Co.—150 Broadway, New York City

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DIXON'S
FLAKE GRAPHITE

There is but one flake graphite and its name is DIXON. For 100 years this name has been associated with graphite, and today, to thousands of exacting men in every line of industry, it is synonymous with the best graphite obtainable.

It is an ideal natural lubricant that spreads a smooth unctuous veneer over rubbing surfaces and reduces wear to a minimum.

Recommended for cylinder and bearing lubrication, for coating gaskets, packings, etc. Properly mixed with grease or oil their consumption is greatly reduced.

No. 1 COARSE FLAKE **No. 2** POWDERED FLAKE

Write for Circular 61-C

JOSEPH DIXON CRUCIBLE CO.
Jersey City, New Jersey

1827 1927
100th Anniversary



Parks shipping room saw *at a lower price!*

was $75.00
NOW $60.00
without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast. Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

FILL OUT AND MAIL THIS COUPON—NOW!

I. I.
The Parks Wood-Working Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.

You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.

Name .....
Firm Name .....
Address .....
City ..... *State* .....

The Parks Woodworking Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory:
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

(*Continued from page* 124)

it at the same time—a condition which in the state of things is not attainable. Must we therefore continue to carry this millstone hung about our necks? Lacking as we do the economic conditions which would permit us to eliminate the load at one stroke, is there anything else we can do about it?

Fortunately there is. As in many other cases, the eradication of this unsound practice which has gained a firm footing is not as simple as the process of getting it started. The elimination of sub-standard material from our industry under the conditions which we face today requires first, an intelligent knowledge of the situation, and later a sincere joint effort on the part of all those who are affected, to achieve the desired result. The course to take is definite, and the steps by which we may accomplish the result are well known.

What Authority Is to Enforce Material Standards?

Who or what in any particular community has the power to say that sub-standard or hazardous material shall not be used? Only one organization has this power, namely, the state or municipal authorities of the community in question who have this police power. It is true that insurance interests have influence in the matter, but theirs is the power merely to grant or to withhold insurance. In the last analysis, when the use of certain material is prevented in a community it is done by the police power of that community for the protection of the public. What authority must be given to the police organization, in order that it may be properly empowered and equipped to prohibit the use of sub-standard material? Obviously back of every police organization there must be some written regulations, laws, or ordinances. If the police power of a municipality is to forbid the use of certain material, there must be something written in the statutes of that municipality which instructs the police organization to do just this and guides them in the administration of their work.

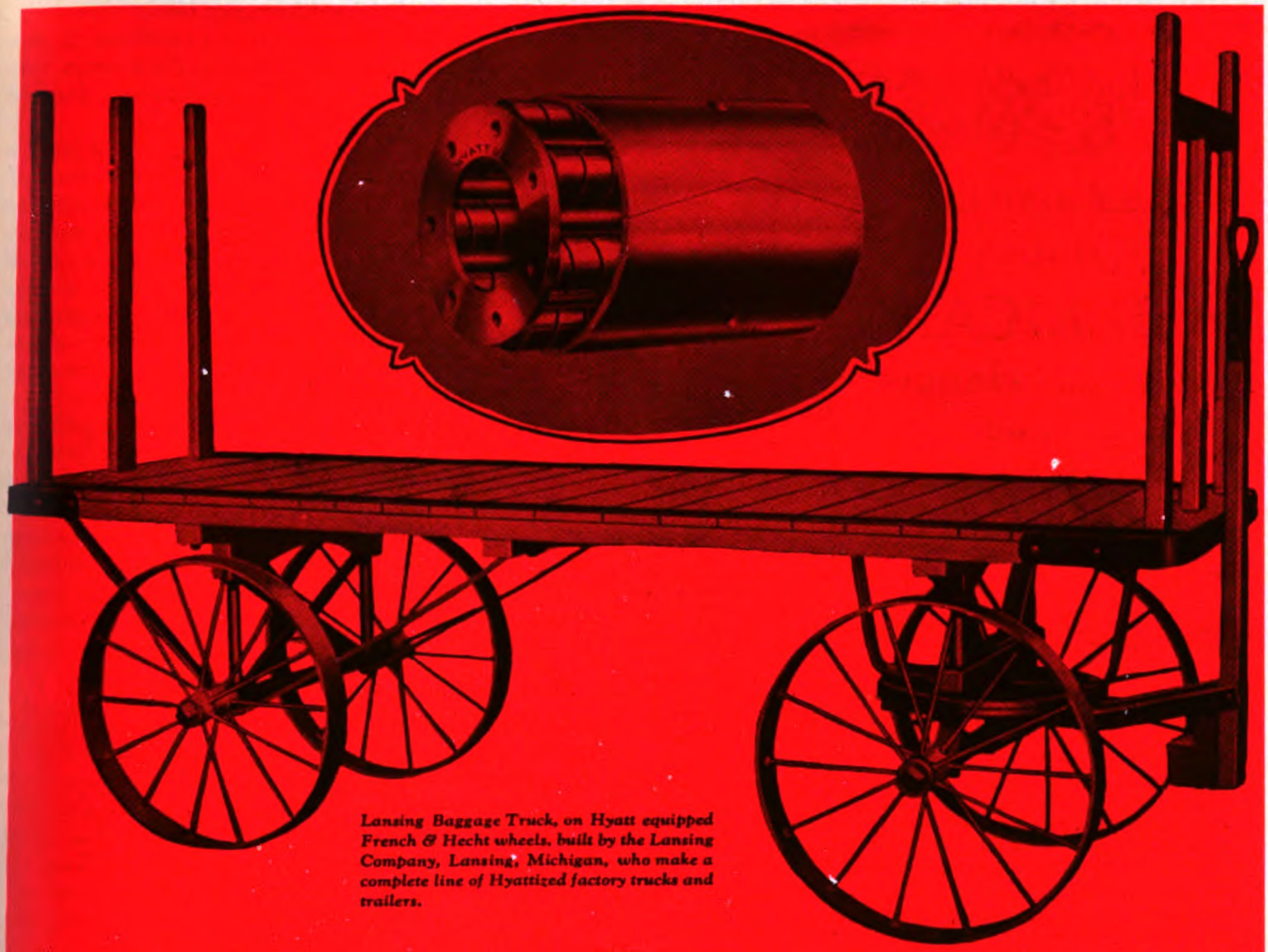
How is it possible to have a code, statute, or ordinance which specifically forbids the use of inadequate and hazardous material? It is far simpler to indicate what shall be used than to forbid the use of the multitude of variations which might be detrimental to public interest. Therefore, the code, ordinance or statute under which our police organizations are to function should preferably say that installations within the limits of the municipality shall conform to such and such regulations.

This brings us to the subject of a code. If any police power attempts to enforce a code which has been devised by a certain circumscribed group, and which may therefore conceivably be designed for the interest of that group only, it will find itself liable to check by injunction or otherwise. The second point, therefore, is that the code which is written into the statutes as a standard by which materials shall be manufactured and installed must be one which cannot be attacked successfully on the ground of unconstitutionality or on the ground that it has been prepared or controlled in its preparation or administration by local groups or individuals with selfish aims, or imperfect knowledge of all the factors involved.

Is there any process which will permit a code or a standard, prepared with all due diligence by qualified parties, to be nationalized so to speak, and made safe and invulnerable for purposes of enforcement? The direct means to accomplish this is through the procedure of

(*Continued on page* 130)

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Lansing Baggage Truck, on Hyatt equipped French & Hecht wheels, built by the Lansing Company, Lansing, Michigan, who make a complete line of Hyattized factory trucks and trailers.

Steadily They Roll Along

THERE is no quitting time for Lansing Baggage Trucks. Year after year, steadily at busy stations, they take their daily pounding—and stand up unflinchingly.

In the wheels are the Hyatt Roller Bearings that bear the brunt of it. These sturdy bearings are built to absorb the shocks of loading and keep them from racking the truck. Hard daily poundings mean nothing in their long lives.

Hyatts are practically frictionless and show no wear after years of hard work. The trucks roll easier and require less man or motor power. Maintenance costs are negligible. Lubrication months apart is ample.

That is why Lansing, like so many other leading manufacturers of industrial trucks and trailers, employs Hyatt Roller Bearings exclusively. No other bearing can give service so smooth, so economical, so lasting.

Specify Hyatts on your next truck or trailer order.

HYATT ROLLER BEARING COMPANY

NEWARK PITTSBURGH CHICAGO PHILADELPHIA DETROIT
OAKLAND WORCESTER CLEVELAND

HYATT

ROLLER BEARINGS

PRODUCT OF GENERAL MOTORS

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Uniform in Quality "AMERICAN" Pulleys *and* Hangers *and* UTICA Sheets and Pillow Cases

REG. U.S. PAT. OFF.

THE experience of uniform quality and long wear has made Utica Sheets and Pillow Cases favorably known to millions of women.

This steadfast quality is the fruit of manufacturing skill and the most efficient equipment.

Included in this equipment are "American" Steel Split Pulleys and "American" Pressed Steel Beam Heads. Their selection by the makers of Utica Sheets must rest upon these same fundamentals of uniform quality, long life, skilled workmanship and sound construction.

The millions of "American" Pulleys, Hangers and other pressed steel products serving the industrial world, are evidence that this name, too, is favorably known through experience to thousands of mills and factories in this and virtually every other country where manufacturing is carried on.

The features which make "American" Pulleys and Hangers so efficient are described in special folders. Have your secretary write for these.

THE AMERICAN PULLEY COMPANY

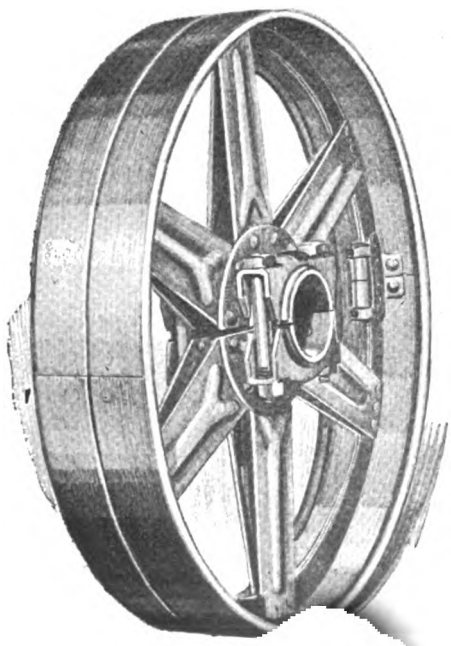
Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia

For nearest distributors see MacRae's Blue Book

AMERICAN PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS

PATENTED PATENTED



Strength, with light weight, is a characteristic of both "American" Pulleys and "American" Shaft Hangers. Both are efficient tools of power transmission and because of their convenience and trim, graceful lines, both are distinctly in harmony with modern shop practice.

(*Continued from page* 128)

American Engineering Standards Committee. It alone possesses the structure, the personnel, the universal membership and the prestige which are necessary to achieve this end.

Finally, whose business is it to prepare the codes, to compile the technical information, to determine the standards of quality which shall be approved by the American Engineering Standards Committee and thus made national in scope and enforceable? So far as the electrical manufacturing industry is concerned, that is our own business right here in NEMA, in so far as quality and construction of materials is concerned. We must also cooperate constructively with N. F. P. A. on installation rules and requirements.

In reviewing the steps which lead from the purchasing public to our door, I have tried to present a broad picture of the general processes with a word to justify each step as it was mentioned. It behooves us, however, to have a more definite picture than this, in order that we may work actively and effectively upon the elimination of sub-standard material, which is admittedly one of the most serious conditions we have to face in the industry today.

How Standard Specifications Can Be Set Up

Let us find out exactly what we have to do. The first step is the preparation of NEMA Standards. There is no aggregation of intelligence better able to say fundamentally how wire or cable or motors or transformers or wiring devices should be made than that of the manufacturers who have spent their lives in the development and production of such material. Let us therefore begin by preparing NEMA Standards where these are needed, and revising existing standards when necessary. Let me emphasize the need for the continuous review of standards. To be useful they must keep pace with the most up-to-date ideas in manufacturing. These standards must then be passed on to the American Engineering Standards Committee for approval, or nationalization, if you will. They tie in with the National Electrical Code, and the National Electrical Code later ties in with the uniform state statutes and ordinances, which this Association has helped to promulgate in all parts of the country with considerable success. These uniform ordinances are described with the detail they merit in a booklet entitled "The Need for a Uniform Ordinance" published by the Association. Printed copies of uniform state statutes and ordinances so drawn as to be adaptable for the needs of any community may be obtained from the Association headquarters. The essential feature of these ordinances is contained in the following statement from Section No. 7:

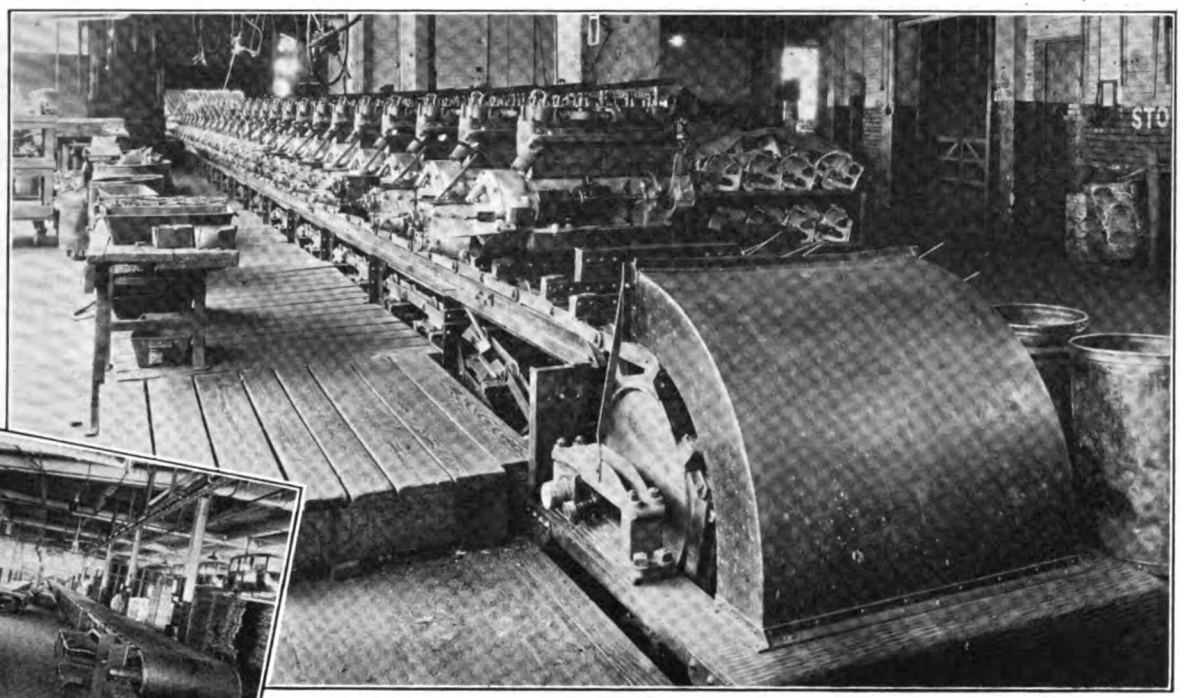
"No certificate of inspection shall be issued unless the electric light, power and heating installations are in strict conformity with the provisions of this ordinance, the statutes of the state of . . . the rules and regulations issued by the industrial commission of . . . under authority of the state statutes, and unless they are in conformity with the most approved methods of construction for safety to life and property. The regulations as laid down in the National Electrical Code, as approved by the American Engineering Standards Committee, and in the National Electrical Safety Code as approved by the American Engineering Standards Committee shall be prima facie evidence of such most approved methods."

It is important to emphasize at this point that once a statute or an ordinance has been adopted, it is usually a slow and difficult process to amend it. The rapid and

(*Continued on page* 132)

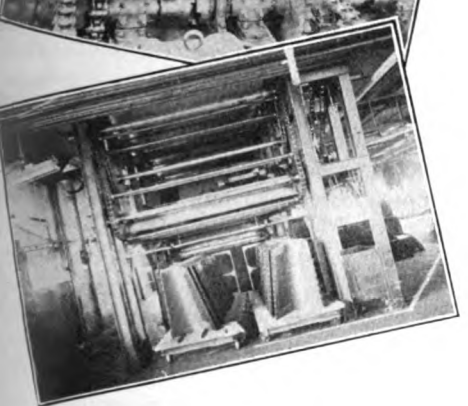
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From Motor to Chassis Progressive Assembly Over

ANCHOR CONVEYORS

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In this plant, also, enormous savings have been made in labor costs and floor space, in addition to speeding up production considerably.

Further information, together with illustration of this installation, will be sent on request.

Fill in the coupon and mail.

Anchor Steel & Engineering Co.

2563 Bellevue Ave. Detroit, Mich.

MAIL THIS COUPON

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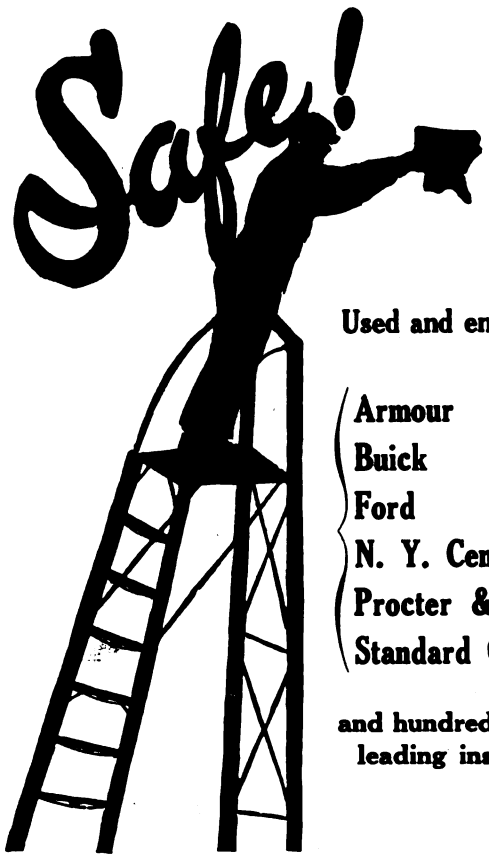
Without any obligation, send me full details of the installation shown in INDUSTRY ILLUSTRATED.

Name ..... ***Company*** .....

Position ..... ***Products*** .....

Address ..... ***City*** ..... ***State*** .....

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Used and endorsed by

Armour
Buick
Ford
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Procter & Gamble
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and hundreds of other leading institutions

DAYTON Safety Ladder

The only safe ladder ever built. Will give *your* men complete security, enabling them to do far better, faster work. Provides foot room, tool room and wide reach for two men. Cannot slip, tip, sway, wobble or collapse, yet folds compactly for carrying or storage. Made in sizes from 3 to 16 feet, of steel-braced aeroplane spruce, for every factory and office use. Prices are most moderate!

Write Dept. I-9 for full information

The Dayton Safety Ladder Company
121-123 West Third Street
CINCINNATI, OHIO

(*Continued from page* 130)

continuous development of the electrical industry requires that there shall be flexibility, permitting the advantages of engineering and commercial development to be passed on to the public as rapidly as they take definite form. Machinery is in existence and is functioning satisfactorily in the continuous revision of the code; therefore, this ordinance as drawn is virtually an endorsement at any time of the best engineering practice.

There are in addition to the items which have been enumerated two requirements which must be met in order that we may deal effectively with sub-standard material. We must have a testing laboratory, which will determine whether any particular material does or does not conform to such standards as may have been formulated. The test requirements, methods and procedure of this laboratory must be nationalized in exactly the same manner and for exactly the same reasons that we must nationalize our standards of construction.

Finally, we must have a properly maintained and instructed field force of inspectors who will determine whether or not material is being manufactured and installed in accordance with our nationalized codes and standards and who will act for or coöperate with the police organizations of the different municipalities and see that the necessary provisions and regulations are intelligently carried out.

Testing Laboratories Are Essential

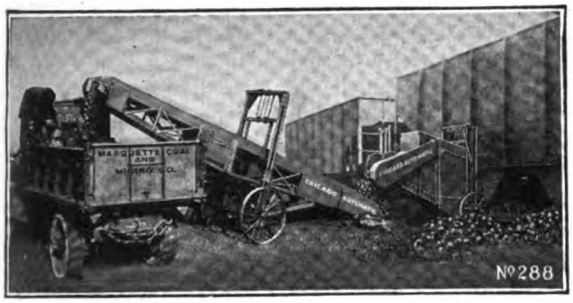
Considering first the testing laboratory, it would not profit us to review in detail at this time the lack of complete understanding and coöperation between the manufacturers and the Underwriters' Laboratories, which during a certain period resulted in inefficient operation. Suffice, that as a result of about eight years of study and unselfish effort, a definite procedure for coöperation has been drawn up and agreed upon by the Underwriters' Laboratories and the manufacturers. It is indeed encouraging to announce that the great amount of work which has been done by the Underwriters' Laboratories-Electrical Manufacturers Conference has finally resulted in complete unanimity as to the objects to be achieved and the means of accomplishing the desired results. The test requirements of the Underwriters' Laboratories are being put through A. E. S. C. procedure and thus nationalized as rapidly as the work can be carried on. When these test requirements have been approved by the American Engineering Standards Committee, they will constitute a nationally recognized aggregation of tests which will determine conformity with fire and casualty requirements by reference to nationally recognized standards designed to eliminate these hazards. Under the new arrangements with the Underwriters' Laboratories they have agreed to test electrical apparatus and material under NEMA standards approved by the A. E. S. C. when such testing service is desired by the electrical manufacturers. With the extension and adequate instruction of existing inspection organizations, the machinery for eliminating sub-standard material will be complete. Nationalized standards continually checked by a testing laboratory in accordance with nationalized procedure, tying in with efficient inspection and properly drawn codes and ordinances, will in a relatively short time eliminate sub-standard material from use. It cannot be too strongly emphasized, however, that the coöperation of every individual member of the Association is needed.

(*Continued on page* 134)

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CHICAGO AUTOMATIC

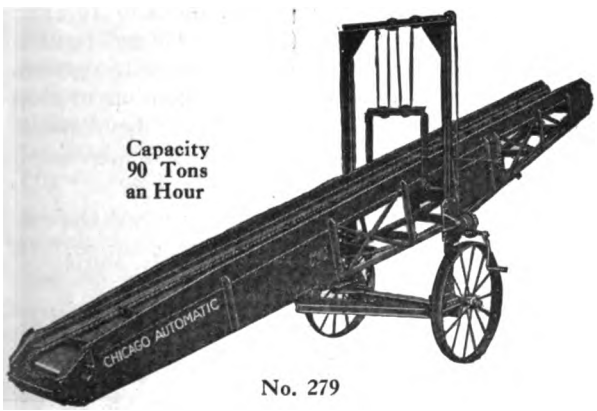
Conveyors and Track Unloaders Make Possible a Ton a Minute Car Unloading



Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use
90 tons an hour is the capacity of both machines



The Model T. U. goes under any car and handles all classes of fuel



No. 279

This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable conveyor

982 Old Colony Bldg. Chicago

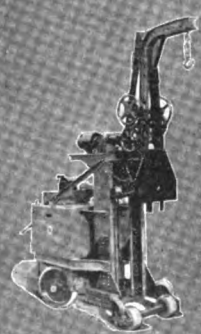
Representatives desired for several Industrial Centers











For the Industrial Executive

New machines for handling old problems are described in our new catalog just off the press. Generously illustrated to show clearly ways and means of reducing industrial handling costs through the use of Electric Trucks and Tractors.

Besides the standard units there are many types of special trucks shown for meeting special conditions.

A really worth while catalog for every industrial executive interested in increasing production in his plant. Tell your stenographer to write for Bulletin 35-A.

The
Lakewood Engineering Company
12000 Berea Road, Cleveland, O.

The EXPORT OFFICE: 30 CHURCH ST., NEW YORK CITY — CABLE ADDRESS: BROSITES
LAKEWOOD ENGINEERING CO.
CLEVELAND OHIO

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Hang it wherever
you are now using
a Chain Block

Light in weight, but substantial and highly efficient is this ROEPER Type "R" Hoist. It has very few parts. Spur Gear and Worm Driven, with the difficulty of adjustment between worm and gear eliminated.

It has a totally enclosed Dust Proof Frame and all parts automatically lubricated.

Capacities 500 to 6,000 lbs., inclusive. Write for complete description.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
TRAVELING CRANES ELECTRIC HOISTS TROLLEYS

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PRESSED STEEL
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Your Costs DOWN — Your Profits UP!

FACTORY executives are rapidly learning how POWELL Pressed Steel Handling - Equipment helps them pare down production costs, thus widening their profit margins. Let us send you complete illustrated literature and prices.

The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

For ... rtised in this issue write Industry Illustrated

(*Continued from page* 132)

in order that this work may be done in a minimum of time. Especially do I request the members of this Division to impress upon all their representatives the importance of coöperation with the Association's work in the following manner:

What the Manufacturers Association Must Do

First, in the formulation and continued revision of NEMA standards.

Second, cöoperation with the Casualty and Fire Prevention Committee in the work of revising the articles of the National Electrical Code. Desired changes or revisions and improvements of any kind, applying to the 1928 edition should be sent in immediately. One of the difficulties with which we have had to contend in the past has been destructive criticism—the tendency to wait until a proposed final revision has been drawn and then raise all manner of objections to this proposed revision. A suggested improvement is preferable to an objection and these suggestions should come while the Article Committees are at work on the revision.

Third, coöperation with your Committee on Underwriters' Laboratories, this to consist of passing on to them all possible suggestions and full information regarding every type of difficulty, great or small, encountered in negotiations with the Underwriters' Laboratories. There is in this request no thought of collecting evidence against the Underwriters' Laboratories—the representatives of the Association and the Laboratories are working in complete harmony—but is absolutely necessary that they should have as many specific cases as possible before them, in order that wise precedents may be established in completing the work.

Finally, your hearty support of the present and future programs of this Association in promoting the adoption of uniform codes and ordinances throughout the country is unqualifiedly recommended and especially desired.

The picture I have endeavored to present to you is not the result of haphazard development. It is the fruit of many years of patient and unselfish work on the part of representatives of some of your member companies whose work and training enabled them to foresee and to work toward the consummation of these results, before their desirability had been generally recognized.

In particular may I direct your attention to the personnel of the following Committees of the Association, basic in the elimination of sub-standard material from the electrical industry:

Committee on Promotion of Codes, Statutes and Ordinances
S. L. Nicholson, Chairman; T. E. Barnum, C. A. Bates, D. R. Bullen, B. B. Dinsmore, H. B. Kirkland, D. H. Murphy.

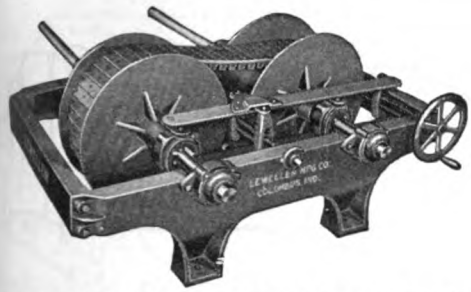
Underwriters' Laboratories
S. L. Nicholson, Chairman; T. E. Barnum, F. A. Barron, R. W. E. Moore, H. R. Sargent, W. E. Sprackling.

Casualty and Fire Prevention Committee
R. W. E. Moore, Chairman; L. F. Adams, T. E. Barnum, C. A. Bates, Walter E. Holland, C. L. Kennedy, R. H. Manson, D. H. Murphy, H. R. Sargent, A. F. Van Dyck, J. A. Wahlgren, J. Lester Woodbridge, H. B. Kirkland, Member-at-Large.

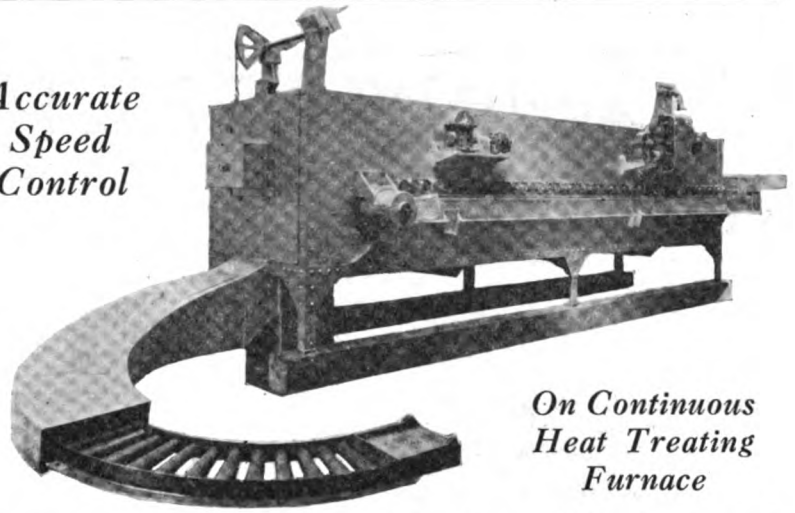
Standards Committee
C. A. Bates, Chairman; L. F. Adams, H. A. Calderwood, L. W. Chubb, O. A. Frederickson, W. F. Hubley, E. H. Jacobs, R. H. Langley, R. H. Manson, R. W. E. Moore, A. H. Timmerman, F. T. Wheeler.

Much that I have endeavored to explain in this discussion would have been understood only with difficulty at an earlier date. The delayed recognition of the wide scope and universal value of these efforts should result in unusually prompt and cordial support at this time.

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Accurate Speed Control



On Continuous Heat Treating Furnace

LEWELLEN TRANSMISSION UNIT

Speed control is an absolute necessity on this Metal Equipment Company Electric Continuous roller hearth furnace, used in the treatment of automobile springs at the

L. A. Young Industries, Inc.

plant in Detroit.

With a LEWELLEN variable speed transmission, speed changes from 7 minutes to 35 minutes are obtained. A speed indicator indicates the relative speeds, enabling the operator to duplicate exact heating conditions on various material treated.

LEWELLEN Transmissions do not jerk. Speeds can be varied from slow to fast and fast to slow gradually as required.

Write for the LEWELLEN catalog.

There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN Variable Speed TRANSMISSION

LEWELLEN MFG. CO., 1300—10th STREET, COLUMBUS, IND.

POWER

The moving of heavily loaded cars requires a great amount of power.

The very appearance of the Atlas Car Mover suggests power. Its scientific construction develops power, sufficient to move the heaviest cars and still have a margin of reserve.

Its positive grip spurs never fail to hold and assure perfect safety.

A locomotive as far as practical results go, it places cars with an astonishing speed and ease.

OUR POLICY IS TO SELL THRU THE JOBBER



The Famous

ATLAS CAR MOVER

Manufactured Only by

Appleton Car Mover Co.

Appleton, Wis.

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.

CANTON, OHIO

New York Office, 203 E. 15th Street

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WHERE to PURCHASE MODERN EQUIPMENT for Mill Shop & Factory

BEARINGS

Bearing Metal—The Magnolia Metal Company offers a booklet on how to select bearing metals, and how to melt, pour and finish linings. See page 94.

Oilless Bearings—Bearings that give years of service without wearing and cut manufacturing costs are described by The Arguto Oilless Bearing Company. See page 121.

Roller Bearings—that enable trucks to give uninterrupted service under severe conditions. See page 129, Hyatt Roller Bearing Co.

Ball Bearings—New Departure Ball Bearings eliminate shutdowns for bearing adjustment, replacement or lubrication failure. Page 67. The New Departure Manufacturing Company.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Motors—Reliance motors reduce inspection. See page 47. Reliance Electric & Engineering Co.

Howell Red Band Motors are water and moisture proof. See page 101. Howell Electric Motors Company.

A motor so equipped with ball bearings that a lubrication saving of 85% is made. See page 122. Valley Electric Co.

Equipped with sealed bearings that keep dust out and retain oil. See page 100. The Master Electric Company. "Bd" and "CD" are the outstanding direct-current motors. General Electric Company. See pages 33-34.

Grinders—Electrically equipped that double production. Cincinnati Grinders, Incorporated. See pages 70-71.

Arc Welding—Prizes will be won by those who demonstrate how arc welding can be made of greater benefit to humanity. For contest details, see page 45. The Lincoln Electric Company.

Portable Electric Lights—Bulletin 501-S, describing all the uses of the Reelite cable, is offered by Appleton Electric Company. Page 61.

Lights—Where and when needed are described by The American Fixture Company. Page 143.

MAINTENANCE

Paint Spray Equipment—Pays for itself in what it saves. Binks Spray Equipment Co. See page 2.

—One spray does all your painting. Five times faster than a brush. Saves 80% in time and costs. The Alexander Milburn Co. See page 139.

Paints—varnishes and enamels that are better protective products for every maintenance requirement. See page 147. The Arco Company.

Concrete floor hardeners and other paint preservatives are shown on page 119 by L. Sonneborn Sons, Inc.

Guarantee to Remain White Longest. Write for booklet "More Light." U. S. Gutta Percha Paint Company. Page 3.

The Vortex Painting Method is described by The Vortex Manufacturing Company. Page 137.

Window Cleaners—Cleans the dirtiest windows quickly and safely. See page 141. The Gerson Stewart Corp.

Cleaning Material—Industrial Cleaning Materials and Methods are described by The Oakite Products, Inc. Page 141.

Flake Graphite—for cylinder and bearing lubrication, and for coating gaskets, packings, etc. See page 128. Joseph Dixon Crucible Co.

Rust-proofing Oil—Rust Veto for preventing rust. E. F. Houghton & Co. See Inside Back Cover.

Fans—A man cooling fan that increases production is described in circulars offered by Robinson Ventilating Company. Page 140.

Exhaust Fans—quiet operating exhaust fans for private and general offices. See page 143. Diehl Manufacturing Company.

Safety Ladders—made in sizes from 3 to 16 feet. Write Dept. 1-9 for full information. The Dayton Safety Ladder Co. See page 132.

Monitors—designed to increase daylight. See page 6. Detroit Steel Product Company.

Brushes—and wire wheels. Guaranteed to stay together for full service life. See page 116. The Osborn Manufacturing Company.

MATERIALS HANDLING

Overhead Handling Systems—A two rail overhead system that gives steadier, more efficient transportation of hard to handle products. The Atlas-Chicago Co. See page 7.

—A complete line of hoists, chain blocks, trolleys, traveling cranes, and monorails. See Reading Chain & Block Corp. Page 125.

—that speed production in America's prominent automotive plants. Write for details. Anchor Steel & Engineering Co. Page 131.

Overhead Monorail Systems—A new seventy-two page book on materials handling via the ceiling. See page 53. The Louden Machinery Co.

Hoists—that have totally enclosed dust-proof frames and all parts automatically lubricated. See page 134. Roeper Crane & Hoist Works, Inc.

Electric Hoists—an electric hoist for every purpose. Shepard Electric Crane & Hoist Company. See Back Cover.

Electric Trucks and Tractors—to cover every conceivable industrial need. Write for booklet 35-A. The Lakewood Engineering Company. See page 133.

Trucks—Yale K24 Tractors turn in the shortest possible radius. See page 36. Yale & Towne Mfg. Co.

(*Continued on page* 138)

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One Step Further in Vortex Painting Convenience

Meet our Field Supervisor

"I AM one of the Vortex field supervisors. My job is to take the last small factor of nuisance out of industrial painting.

"I work either on new construction, or repainting jobs, wherever the management wants to be rid of painting worries and get the highest grade of paint, actually on the wall, at the lowest attainable figure.

"When I get on a painting job, I bring as many Vortex Equipments as are needed —big, rapid action paint guns that work on our exclusive air-confined principle. No charge is made for their use. I instruct and supervise the common labor used to operate the guns. I see the job through.

"All this service wouldn't mean a thing if Vorcolite wasn't the finest kind of paint to put on a factory interior—a rich, brilliant, light diffusing flat white, that covers in a single application—the one paint that is specially prepared to go through a gun —any gun—without giving trouble."

Remember, our Supervisor plan is primarily for new construction. In an operating plant, your own maintenance crew can use Vortex Equipment and Vortex Paints with entire satisfaction, without any outside supervisor and effect a still greater saving that cuts cost to the lowest notch consistent with fine work. Send today for check sheet to use in estimating costs on your approaching paint job.

THE VORTEX MANUFACTURING CO. · *1977 West 77th Street, Cleveland, Ohio*



VORTEX MANUFACTURING CO.
Cleveland, Ohio

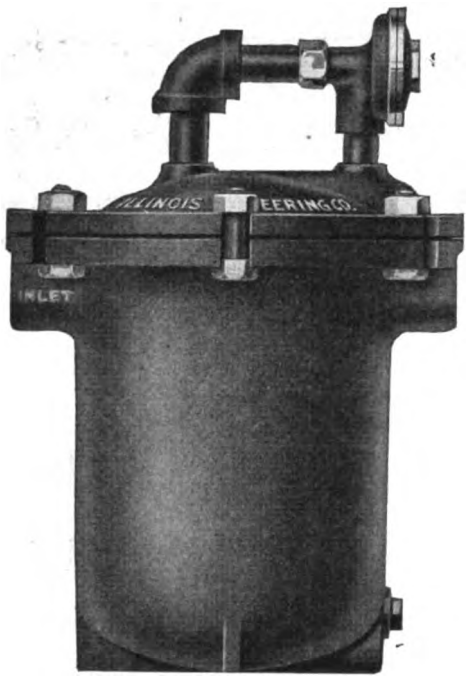
Please send me your check sheet for estimating paint on a square foot basis.

Name of Concern _____

Address _____

Attention _____

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ILLINOIS Eclipse Combination Blast Trap

Extremely sensitive and efficient, the **Eclipse** Combination Blast Trap is unsurpassed for **Quickly** removing the air and water of condensation from Unit Heaters, Vento Coils, Stacks, Dry Kilns, etc.

When the heating system is started, air is rapidly vented through the Thermo by-pass and quick and positive steam circulation is thus obtained.

Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving the maximum heat from steam used.

No. 15 Drip Trap (furnished in nickel plated finish) is extensively used on Sterilizers, Steam Kettles and similar apparatus.

Write for Bulletin 133

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPORATED 1900
CHICAGO

(*Continued from page* 136)

Lift Trucks—and platforms that won't wear down or wabble. The Stuebing-Cowan Co. See page 117.

Pneumatic Conveying—The modern system that recovers 99% of dust and fumes. The Dust Recovering & Conveying Company. Page 57.

Belt Conveyors—that save man power. See page 142. Weller Mfg. Co.

Conveyors—Jeffrey conveyors pay for themselves. See page 5. The Jeffrey Manufacturing Company.

Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company. Page 133.

For eliminating handling wastes, reducing time between operations, write for "Seven Economies of Logan Conveyors." Logan Company. See page 1.

Self-Couplers—ideal for any castor type trailer. Bulletin M-130 tells about it. See page 41. Mercury Manufacturing Company.

Scales—"Weigh While You Convey," described by The Merrick Scale Mfg. Co. Page 145.

Vertical Winches—Write for descriptive bulletin. Sprague Electric Hoists Division of Shepard Electric Crane & Hoist Co. See Back Cover.

Car Movers—That move heavily loaded cars are described by The Appleton Car Mover Company. Page 135.

Portable Cranes—A Small Portable Crane that is sent on 30 days' trial is described in Catalog IN. The Canton Foundry & Machine Company. See page 135.

Unions—A free trial offer is made by E. M. Dart Mfg. Co. Page 139.

Pressed Steel Equipment—Handling equipment of pressed metal that reduces costs. The Powell Pressed Steel Co. See page 134.

Speed Reducers—that give smoother, more efficient operation of handling equipment. See page 48. R. D. Nuttall Co.

Wire Rope—of uniform construction that gives maximum protection. Williamsport Wire Rope Company. See page 28.

POWER PLANT EQUIPMENT AND AUXILIARIES

Steam Traps—Unit Heaters equipped with Eclipse Combination Blast Traps operate at highest efficiency giving maximum heat from steam used. Write for Bulletin 138. Illinois Engineering Company.

Temperature Regulator—Sarco Temperature Regulator puts a stop to guesswork. Test it thirty days free. See page 143. Sarco Co., Inc.

Unit Heaters—A heater that raises the efficiency of the worker. American Blower Co. See page 59.

Four distinct and separate types. Write for book. "Industrial Heating." See pages 102-103. Buffalo Forge Company.

Industrial Thermometers—A complete service by the Engineering Staff is offered by The Industrial Division of The Moto Meter Company, Inc. Page 62.

Portable Dust Blowers—that reduce fire hazard and motor troubles. See page 112. Electric Blower Company.

Gas-Fuel Boiler Governor—Designed for steam boilers using gas for fuel. The Chaplin-Fulton Mfg. Co. See page 139.

Centrifugal Pumps—Write for Bulletin No. 52. See page 10. Nash Engineering Company.

TOOLS (Shop Tools, Saws, Files, Chucks, etc.)

Drills—Morse Twist Drill & Machine Company Drills, Cutters, Taps and Dies show the result of over half a century of experience. See page 93.

Grinders and Buffers that give long, uninterrupted service. See page 97. The Hisey-Wolf Machine Company.

The six famous twist drills are described by The Cleveland Twist Drill Company. See page 68.

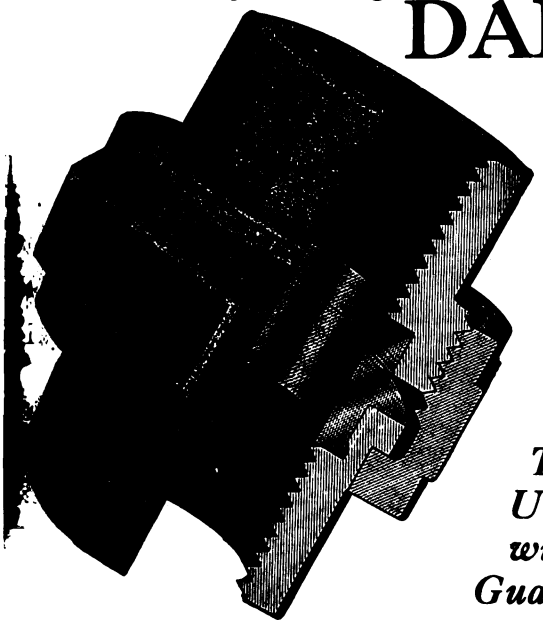
For high speed drills, see The Standard Tool Company. See page 85.

Hi-Speed Drills—that effect big economies in production. See pages 102-103. Buffalo Forge Company.

(*Continued on page* 140)

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To Be Safe, Say DART



The Union with a Guarantee

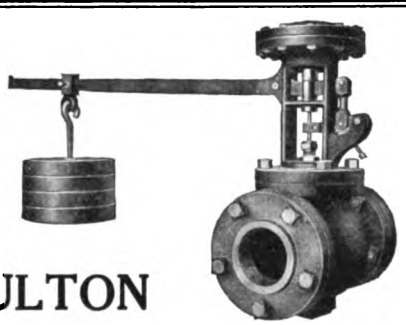
Don't order any old union. There is a big difference between DARTS and others. DART Unions are leakproof; they cannot corrode because the most durable metal composition — Bronze — is used in their construction.

The two bronze ball seats are ground to a true ball finish and make a dependable seal. Made in all sizes in ell, flange and other forms to meet all piping requirements. And they are guaranteed. If one is defective, two are given to replace it. This guarantee is unconditional. Booklet, price lists and sample sent on request.

E. M. DART MFG. CO.
Providence, R. I.

Sales Agents
The Fairbanks Company
New York

Canadian Factory
Dart Union Co., Ltd.
Toronto, Canada



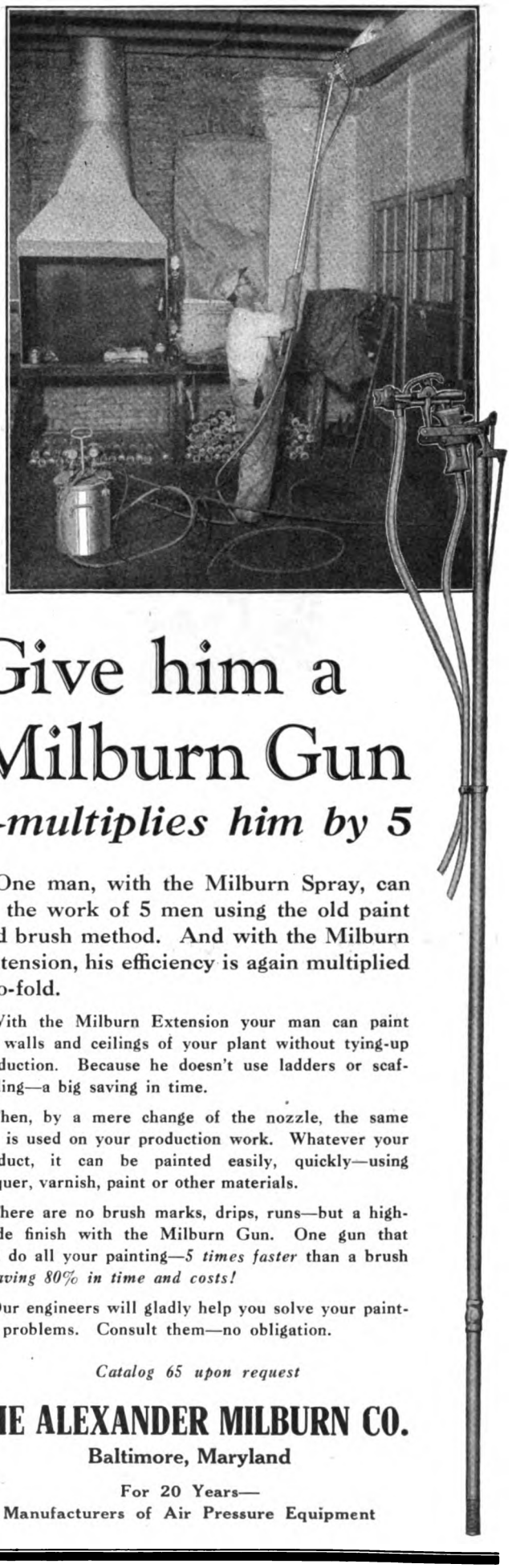
The FULTON Gas-Fuel Boiler Governor

Designed for steam boilers using gas for fuel. It automatically feeds the gas to the boiler furnace in such quantity as to maintain a constant given steam pressure under varying conditions of load. Hence there is no danger of over pressure of steam; nor does the steam ever fall *below* the working pressure.

It will maintain any given pressure desired, from one pound to 150 pounds or more, without attention from the engineer, no matter how frequently or how greatly the demands for steam may vary.

Write for our catalogue

***The* Chaplin-Fulton Mfg. Co.**
28-36 Penn Ave. Pittsburgh, Pa.



Give him a Milburn Gun

—*multiplies him by 5*

One man, with the Milburn Spray, can do the work of 5 men using the old paint and brush method. And with the Milburn Extension, his efficiency is again multiplied two-fold.

With the Milburn Extension your man can paint the walls and ceilings of your plant without tying-up production. Because he doesn't use ladders or scaffolding—a big saving in time.

Then, by a mere change of the nozzle, the same gun is used on your production work. Whatever your product, it can be painted easily, quickly—using lacquer, varnish, paint or other materials.

There are no brush marks, drips, runs—but a high-grade finish with the Milburn Gun. One gun that will do all your painting—*5 times faster* than a brush —*saving 80% in time and costs!*

Our engineers will gladly help you solve your painting problems. Consult them—no obligation.

Catalog 65 upon request

THE ALEXANDER MILBURN CO.
Baltimore, Maryland

For 20 Years—
Manufacturers of Air Pressure Equipment

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..350 lb. Idler DISCARDED as result

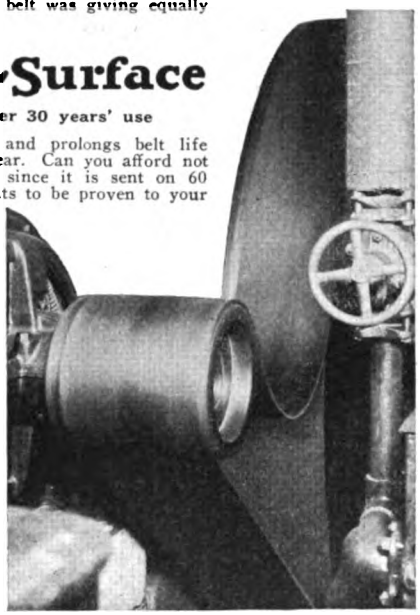
What an interesting power-transmission photo! A sagging belt drive between a 17 inch and a 12 foot pulley; speeds are 750 and 75 R.P.M.; 125 H.P. The pulley centers are 10 ft. apart, which means only 40 ins. between faces. Slippage would send *the belt thru the roof.*

Before use of Cling-Surface, this belt slipped continually in spite of a 350 lb. idler. That extra weight was a menacing strain on both belt and bearings. After applying Cling-Surface the belt delivered the full 125 H.P.; then the idler was removed—the belt gripped! Still, after many years of continuous service, this belt was giving equally good service.

Cling~Surface

Tested by over 30 years' use

cures belt troubles and prolongs belt life for a few cents a year. Can you afford not to try it, especially since it is sent on 60 days' trial test, results to be proven to your entire satisfaction or you need not pay. Write to Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y., stating if conditions are dry, dusty, warm or the opposite—for 1 gal. on approval at $3.50 per gal.; 3 gals. at $3.40 per gal.; 6 gals. at $3.25 per gal. (Tear out this ad. NOW as a reminder to write today.)



Openings for Salesmen



Cast Aluminum Wheels on

ROBINSON

Man Cooling

FANS



There is as much difference between ROBINSON MAN COOLING FANS and other makes as there is between one machine and another of the same type.

ROBINSON FANS are equipped with cast aluminum wheels which give

20% *More Air at Same Speed With Less Power*

These aluminum wheels require less power than any other propeller type wheel on the market. You will appreciate this if you believe in the utmost in fan efficiency at the lowest cost.

Write for descriptive literature and list of users

ROBINSON VENTILATING CO.

Zelienople, Pa.

ROBINSON TURBINE & CONIFLO FANS

(*Continued from page* 138)

2-Speed Electric Drills—necessary for maximum efficiency. See page 123. The Cincinnati Electrical Tool Co.

Wrenches—a descriptive folder is offered by Armstrong Bros. Tool Company. See page 74.

—Of Chrome Vanadium Steel are described by Bonney Forge & Tool Works. See Inside Front Cover.

—Reversible Ratchet Type are shown by The Lowell Wrench Company. Page 80.

Trimo Wrenches have renewable jaws. See page 95. Trimont Manufacturing Company.

Screw Wrenches—used in all branches of industry. Write for literature. See page 105. J. H. Williams & Co.

Vises—designed for milling and drilling machines. See page 120. Edw. Purvis & Son.

Designed to give strength where it is needed and to make the vise handy in actual use. See page 78. Prentiss Vise Company.

For use where smooth operation, economy and efficiency are desired. See page 75. The Charles Parker Company.

For greater efficiency. See page 90. The Columbian Vise & Mfg. Co.

Gears—Catalog No. 30 contains 150 pages covering steel, cast iron, rawhide, bakelite—spur, worm, bevel, mitre and spiral gears. W. A. Jones Foundry & Machine Company. See page 51.

Saws—that cut clean. See page 65. American Saw & Mfg. Co.

Production and accuracy are features of the new Hard Edge Metal Band Saw, product of Simonds Saw and Steel Company. See page 79.

Cut costs with a Parks shipping room saw. The Parks Woodworking-Machine Company. Page 128.

Automatic Saw Files—Machine filed saws cut faster, cleaner and truer. Foley Saw Tool Co., Inc. See page 81.

Files—with greater accuracy and precision for all kinds of work. See pages 108-118. The Grobet File Corporation of America.

Give uniform satisfaction. See page 81. American Swiss File & Tool Company.

Finishing Machines—Flexible rotary filing, grinding and polishing machines. See page 99. N. A. Strand & Co.

Flexible Shaft Grinders—Write for new descriptive folder. Keller Mechanical Engineering Corp. See page 74.

Heavy Duty Grinders—Lathes and motor drills. Write for late catalog and discounts. See page 114. The Standard Electrical Tool Co.

Surface Grinders—Particularly efficient on a wide variety of small tools. Full particulars may be had from the La-Salle Tool Company. See page 100.

Tool Grinders—designed to put a sure and lasting edge on every tool. See page 87. Gallmeyer & Livingston Co.

Electric Toolpost Grinders—Write for booklet "1/10,000 of an Inch." See page 106-107. Wisconsin Electric Co.

Bolt Clippers—that are time savers. See page 77. H. K. Porter, Inc.

Snips—that cut easily. The Grobet File Corporation of America. See pages 108-118.

Shop Tools—Write for catalog that lists many long-lived, accurately designed, reliable tools. Brown & Sharpe Mfg. Co. Pages 88-89.

Electrical Tools—Portable Electric Drills, Grinders and Polishers. See pages 126-127. U. S. Electrical Tool Co.

—Black & Decker Electric Tools make happy workmen. The Black & Decker Mfg. Co. See page 73.

Electric and Pneumatic Tools—are distributed throughout the world. For details see page 82. Independent Pneumatic Tool Co.

Marking Machines—Marking machines, marking dies and machines for numbering on metal. See page 112. The Noble & Westbrook Mfg. Co.

Pipe-Threading Machines—that are really portable, explained in Bulletin No. 72. The Oster Manufacturing Company. See page 114.

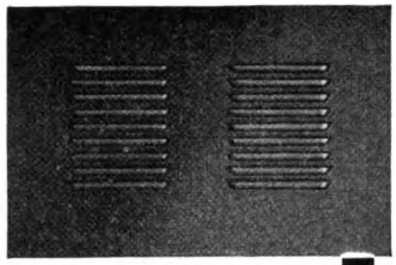
Woodworking Machinery—that reduce production costs because it saves time and labor. See page 81. Heston & Anderson.

Flexible Shaft Units—that give a better finish in less time than by any previous method. See page 90. Biax Flexible Shaft Co.

(*Continued on page* 142)

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SHEET METAL LOUVRES



We can produce them on short notice in large or small quantities. We are in a position to make immediate deliveries in 8" or 12" size Louvres on any size panel. Firms requiring

METAL LOUVRES for MECHANICAL REFRIGERATORS

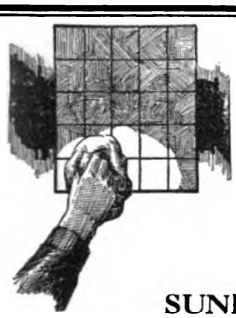
Will find it profiitable to write to us about their needs. Send pencil sketch or blue print.

THE BREESE BROS. CO., Cincinnati, Ohio

FABRICATORS OF

Steel, Iron, Brass, Copper, Monel Metal--Requiring Stamping, Forming, Drawing, Blanking, Punching

See Data A. S. M. E. Condensed Catalogue of Mechanical Equipment, McRae-Hendricks and Thomas Catalogues.



Cleans the DIRTIEST WINDOWS

Quickly—Safely —or your money back

no water Sunburst contains no water to splash on merchandise or floors.

no acid It can't injure workman or damage machines, tools or work.

SUNBURST PASTE cuts rust, grime, carbon and dirt from windows quicker than scraping. Positive in action yet acid-free and safe. It cleans windows with a brilliant, lasting luster. Saves labor—fewer cleanings are necessary. Convenience—use any time without damage to machines, tools, goods or work in process. Inexpensive —costs less than one cent per sq. ft. of pane.

SUNBURST is *unconditionally guaranteed.* Order a barrel, half or quarter barrel—*if it does not satisfy you perfectly we will cancel your invoice in full.*

SUNBURST
WINDOW CLEANING PASTE

LIQUID WINDOW CLEANERS. If you prefer a liquid cleaner we have it—any formula desired. Specialists in Industrial Sanitation we also make Thesco Organic Cleaner, Soft-as-Silk Liquid Soap, Hykotar Disinfectant, Hexstercide Insect Killer.

THE GERSON STEWART CORP.
3541 E. 76th St. Cleveland, Ohio

for want of a nail, the shoe was lost;
for want of a shoe the horse was lost;
and for want of a horse the rider was lost,
being overtaken and slain by the enemy, all
for want of care about a horse shoe nail.
Poor Richard for 1738

"for want of a nail ... the rider was lost"

POOR Richard's example of the far-reaching consequences of a small neglect is an apt one. Yet he could find others equally appropriate today.

In industrial cleaning, for example, failure to employ proper materials and methods is often responsible for a long train of subsequent troubles. Depending on potash, lye and similar uncertain alkalis is frequently the cause of excessive labor consumption, costly delays in production, rehandling, lowered quality and a resultant decrease in profits.

Most progressive concerns, however, take no such chances in their cleaning. Over 18,000 of them now clean scientifically—the Oakite way—with Oakite materials and methods "custom-fitted" to each individual task to assure the most dependable, thorough, economical cleaning possible.

An Oakite Service Man is ready to demonstrate to you. Write us for details, without obligation.

Oakite is manufactured only by
OAKITE PRODUCTS, INC., 40A Thames St., NEW YORK, N. Y.
(Formerly OAKLEY CHEMICAL CO.)

Oakite Service Men, cleaning specialists, are located at

Albany, N. Y., Allentown, Pa., *Atlanta, Ga., Altoona, Pa., Baltimore, *Birmingham, Ala., *Boston, Bridgeport, *Brooklyn, Buffalo, *Camden, N. J., Charlotte, N. C., Chattanooga, Tenn., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, O., Decatur, Ill., *Denver, *Des Moines, *Detroit, Erie, Pa., Flint, Mich., Fresno, Cal., *Grand Rapids, Harrisburg, Hartford, Houston, Texas, *Indianapolis, *Jacksonville, Fla., *Kansas City, *Los Angeles, Louisville, Ky., *Memphis, Tenn., Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Omaha, Neb., *Oakland, Cal., *Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, Pa., *Rochester, Rockford, Ill., Rock Island, *San Francisco, *Seattle, South Bend, Ind., *St. Louis, Syracuse, *Toledo, *Toronto, Trenton, N. J., *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester, Mass.

**Stocks of Oakite Materials are carried in these cities*

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

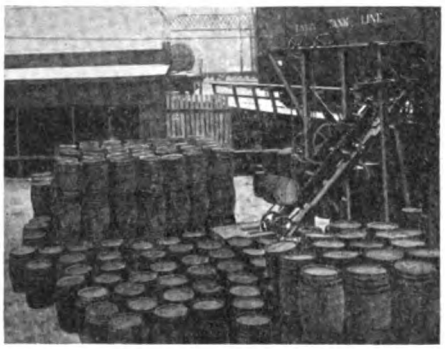
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WELLER

MATERIAL HANDLING EQUIPMENT REDUCES LABOR COSTS



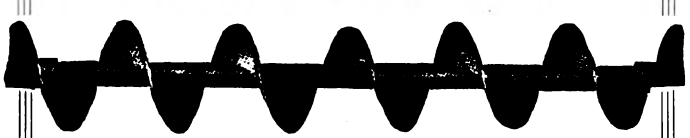
WELLER BELT CONVEYORS for Carrying the raw materials saves man power



BARREL ELEVATOR WELLER also builds Bucket and Package Elevators

Weller machinery is built to give the maximum of service at the lowest possible price for upkeep and if you contemplate the installation of new equipment or the replacing of old —investigate the design and quality of the machinery we make.

SUBMIT YOUR PROBLEM



WELLER SPIRAL CONVEYOR

Cold Rolled Steel Sectional Flights. Evenly Balanced, Run True, Wear Long.

WELLER MFG. CO.

1820-1856 N. Kostner Ave.
Chicago

(*Continued from page* 140)

Aloxite Wheels—meet the demands of the tool room. See page 91. The Carborundum Company.

Set Screws—Write for test samples and Bulletin CE 821. See page 86. The Bristol Company.

Cap and Set Screws—Write for booklet on Allen products and the process accountable for their strength features. See page 76. The Allen Manufacturing Co.

Taper Pin Reamers—Ream holes in any metal three times as fast as a Fluted Reamer. See page 108. The Gammons-Holman Co.

Tap and Die Sets—Little Giant Sets for all mechanics. See pages 83-84. Greenfield Tap & Die Corporation.

TRANSMISSION EQUIPMENT (Including Belting)

Clutches—that prolong the life and increase the working capacity of any machine. Twin Disc Clutch Company. See page 110.

Conway Clutches are noted for easy start, positive pull and quick stop. See page 96. The Conway Clutch Co.

Belting—that gives the kind of service that reduces operation costs. See page 111. I. B. Williams & Sons.

Tested by over 30 years' use. Cling-Surface. See page 140.

The kind that sticks together. See page 115. Chas. A. Schieren Company.

Eliminating the old-fashioned idler pulleys. See page 104. Alexander Bros., Inc.

Belt Lacer—combining the dominant features of speed-power-ease of operation. Clipper Belt Lacer Company. See page 113.

Speed Reducers—The Reeves Transmission represents the only method by which you can get any speed on any machine at any time. Reeves Pulley Co. See page 8.

Anti-Friction Belt Conveyor Idler—Send for new Belt Conveyor Data Book No. 615. See page 148. Link-Belt Co.

Hangers—A Hanger for any door that slides. See page 27. Richards-Wilcox Mfg. Co.

A certified survey showing detailed savings effected by Skayef Hanger installations in seventeen representative industries will be sent on request. See page 4. SKF Industries, Inc.

Pulleys and Hangers—the features which make "American" Pulleys and Hangers so efficient are described in special folders. See page 130. The American Pulley Company.

High Speed Chains—for industrial transmission uses. Write for booklet, "Rolling the Problems out of Transmission." See page 35. The Diamond Chain & Mfg. Co.

Flexible Shaft Equipment—Flexibility is an outstanding advantage of Haskins Equipments. R. G. Haskins Company. See page 118.

Pillow Blocks—the entire bearing arrangement of which is made thoroughly positive and tamper proof. Write for Catalog No. 43. See page 124. The Medart Company.

Variable Transmission Unit—A catalog describing The Lewellen Transmission for varying speeds is offered by the Lewellen Mfg. Company. Page 135.

MISCELLANEOUS

Oilers—Oil cups, oil reservoirs and feeders for all purposes. Gits Bros. Mfg. Co. Page 120.

Counters—A full line of magnetic and mechanical counters for all machines is offered by The Veeder Mfg. Co. Page 85.

Pencils—Twelve colors in thin leads for all purposes. American Lead Pencil Company. See page 145.

Casting Metal Furnaces—a portable furnace for melting babbit metals and other non-ferrous metals, that saves skimming, time and metal. Rowell Manufacturing Co. See page 98.

Goggles—for protecting against light fumes and smoke. Willson Goggles, Inc. See page 123.

Tanks—Chicago Bridge & Iron Works. See page 109.

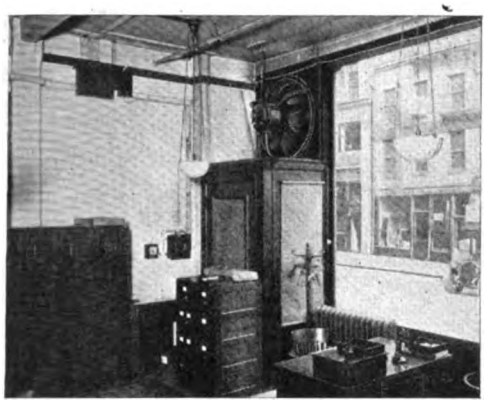
Measuring Instruments—Instruments that carry the guarantee of seventy-odd years of manufacture are described by Taylor Instrument Companies. Page 60.

Louvres—for Mechanical Refrigerators. See page 141. The Breese Bros. Co.

Abrasives—for wood and metal. Trial order offered. H. H. Barton & Son Company. See page 92.

For p *d in this issue write Industry Illustrated*

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DIEHL EXHAUST FANS

because of their quietness in operation, are especially suited for the ventilation of private and general offices.

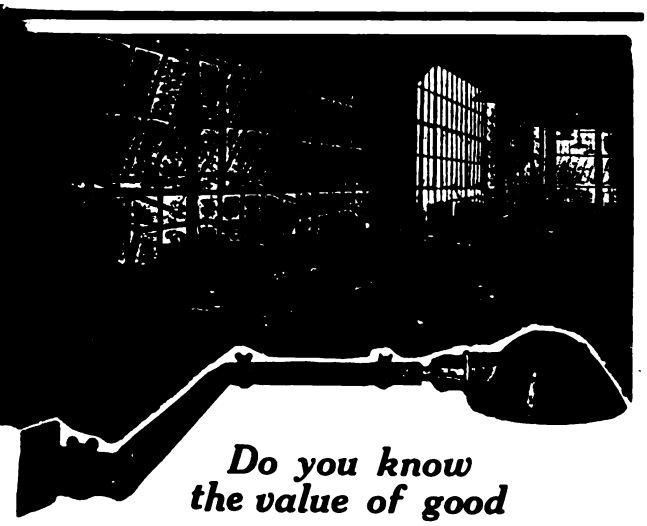
Install DIEHL quiet operating exhaust fans and keep your offices supplied with clean, fresh air.

Send for descriptive bulletins—now.

DIEHL MANUFACTURING CO.
ELIZABETHPORT, N. J.
ATLANTA BOSTON CHICAGO NEW YORK PHILADELPHIA

DIEHL

ESTABLISHED 1888



Do you know the value of good

LIGHTING---?

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Let us make a survey of your lighting needs — write today for booklets, or a representative's service, or both.

Why not get all the facts today?

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30 West Water Street Milwaukee, Wis.



What Does Guesswork Cost You?

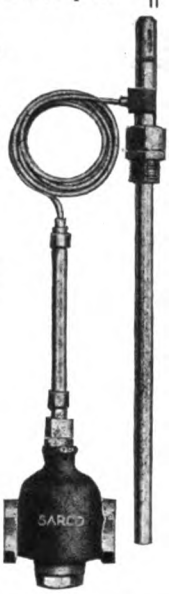
Adjusting valves by hand cannot be depended upon for accuracy in maintaining correct temperatures. At best, this method can be only approximate. The most skilled men can do no more than *guess*—and it is human nature to forget.

Sarco Temperature Regulator puts a stop to guesswork. Once set for a given temperature it maintains *that* temperature *always*. It never varies.

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Is also inexpensive to maintain. Has nothing to get out of order.

Works on steam, gas or hot water heat within any range between 30° and 300° F.



Test it 30 Days Free

Put Sarco on the job for 30 days. If it does not prove its case, return it and don't pay us a penny.

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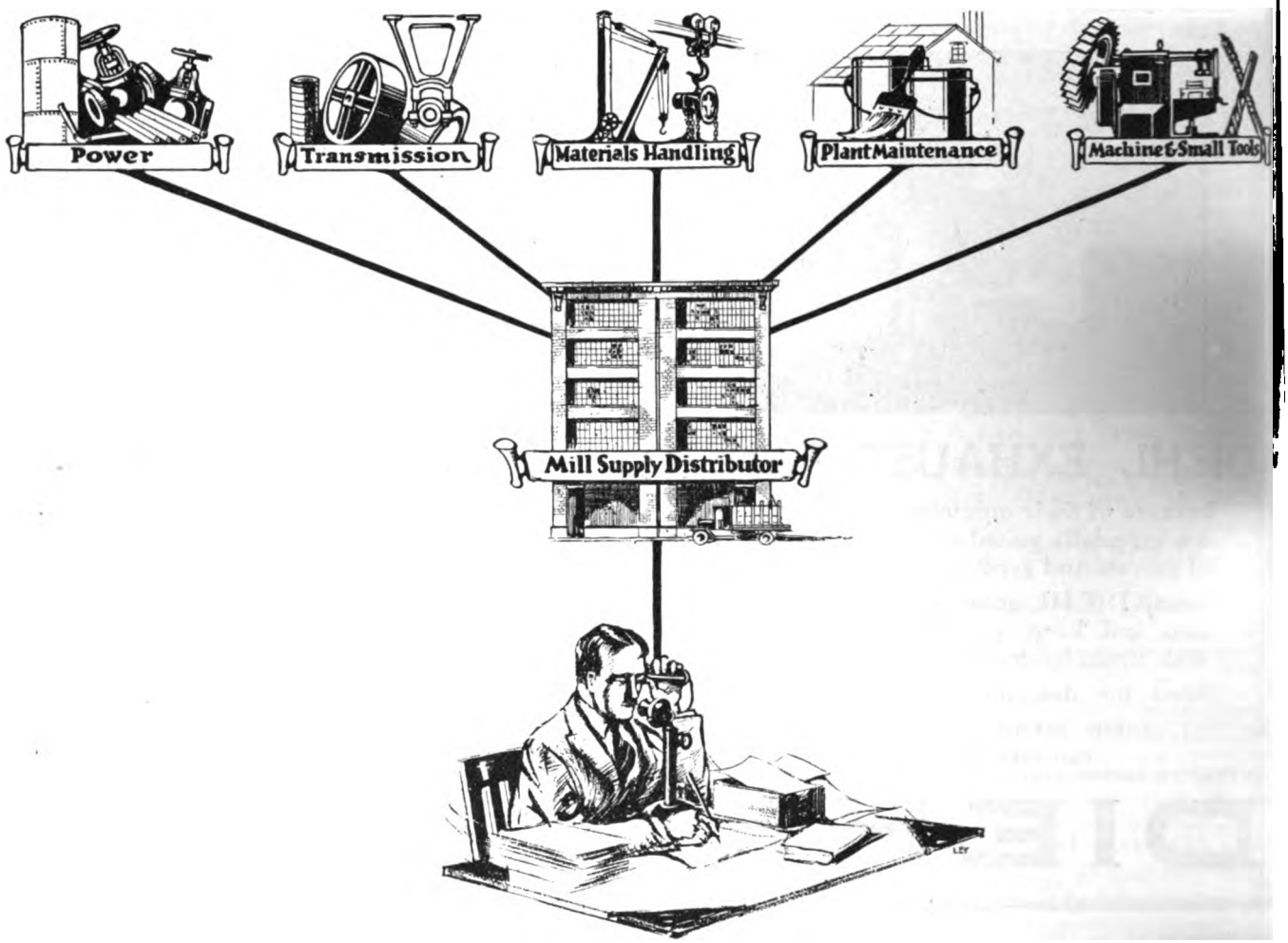
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Buffalo Cleveland Philadelphia

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SARCO TEMPERATURE REGULATOR

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Through his long and intimate knowledge of local conditions, your distributor has chosen the best equipment, machinery and supplies to fit in with your own particular requirements—products of manufacturers who have proven their reliability and have established reputations.

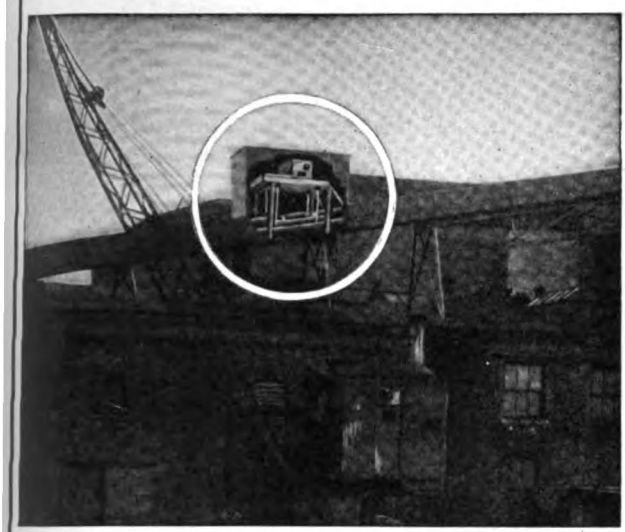
The distributor reduces the necessity of maintaining enormous stocks of supplies; he practically eliminates inventory costs and warehouse expenses; he obviates the necessity of clerical hire and storeroom accounting systems, and he saves valuable time all along the line.

For all this service, **you pay no more in buying from your distributor.**

One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor

Buy from the Machinery and Mill Supply Distributor

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Weigh as You Convey and Eliminate Losses

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Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

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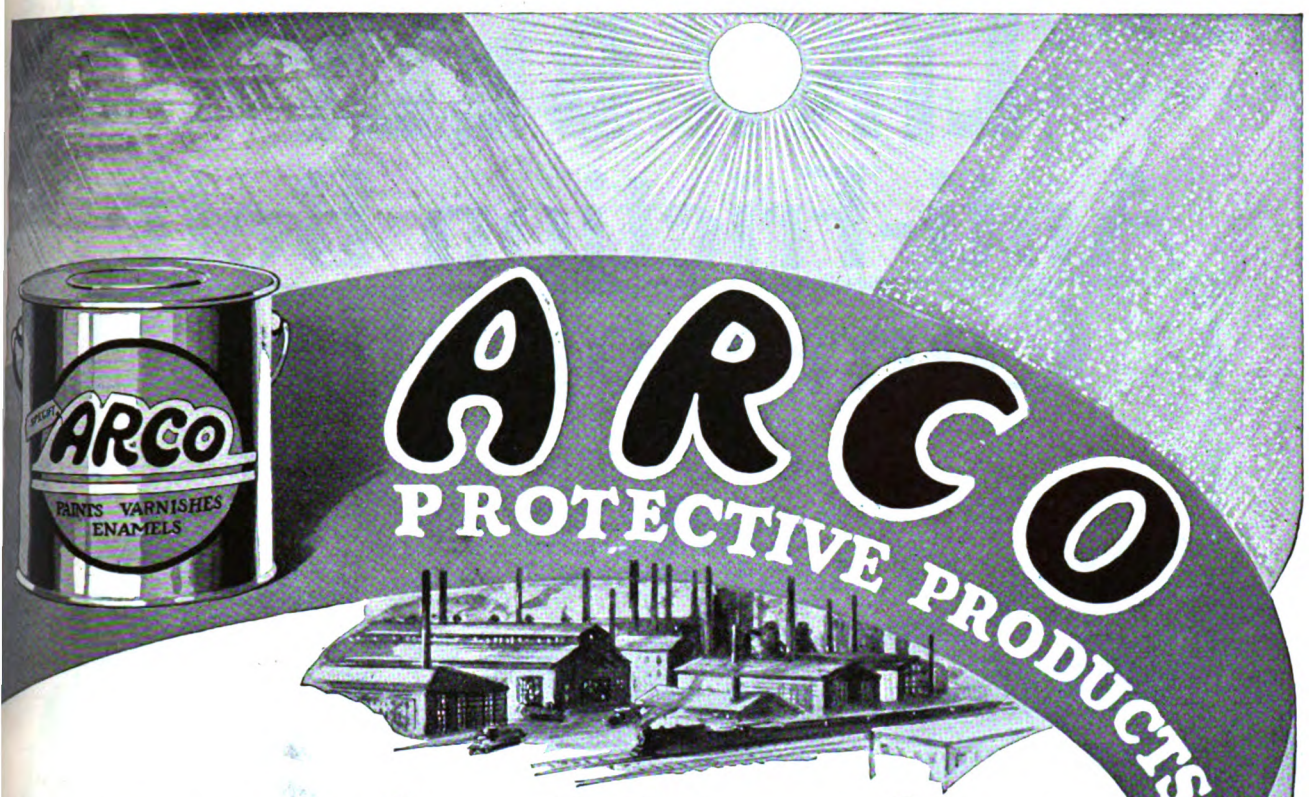
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ARCO Protective Products comprise 6,819 different items, *each one definitely designed to perform a specialized job.* Yet all of them work towards a common goal—a better protective product for every maintenance requirement.

Deterioration is largely due to the improper protection of surfaces. For 46 years, Arco engineers have been studying industrial maintenance problems and supplying corrective products of certified efficiency. This practical experience is yours for the asking.

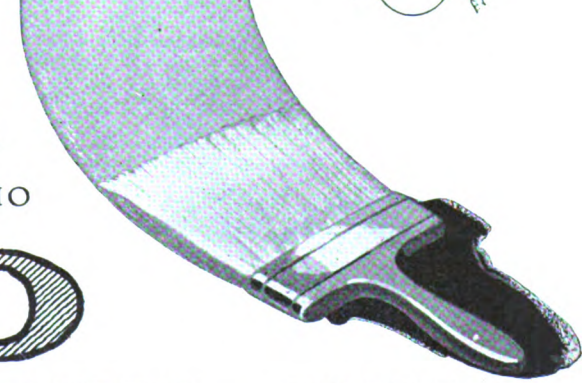
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There is every reason why ARCO should be your company's preferred source of supply for protective maintenance products. Test us with a trial.

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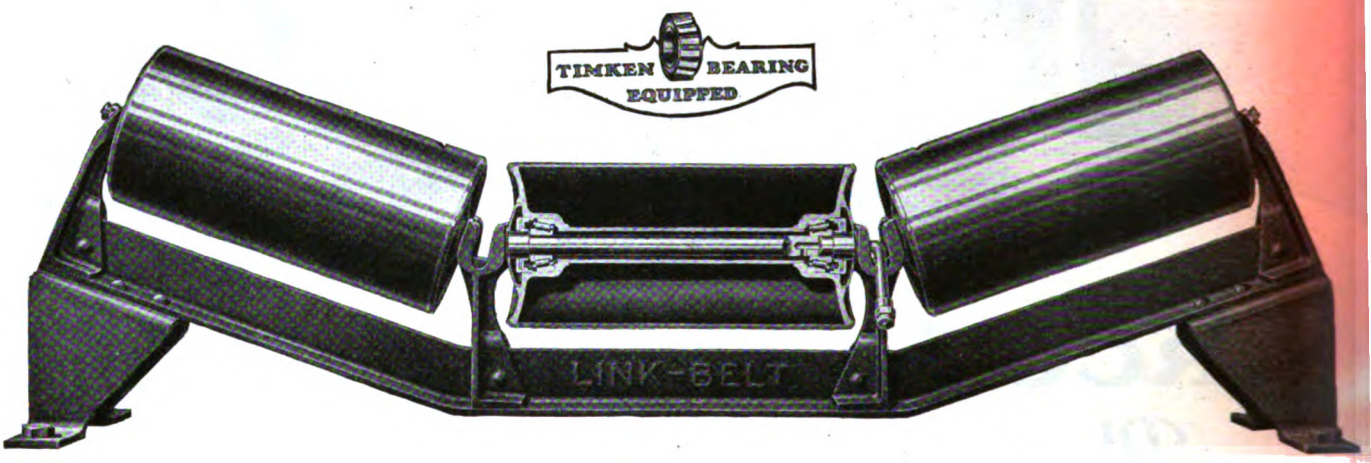


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IN the Link-Belt Anti-Friction Belt Conveyor Idler, we have embodied the engineering and manufacturing experience of a generation in the development of this type of equipment.

As a result of that experience, this idler is manufactured to the closest working tolerances ever attempted. Bearings completely protected.

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For Active Executives, Engineers, Superintendents & Managers in

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G. & A. R. R.

NOV 1 1927

In This Issue:

Engineering Service a Measure of Progress in Machine Tool Manufacture

The Purchaser of the machine tool now buys an analysis of his production requirement as well as a tool to meet it

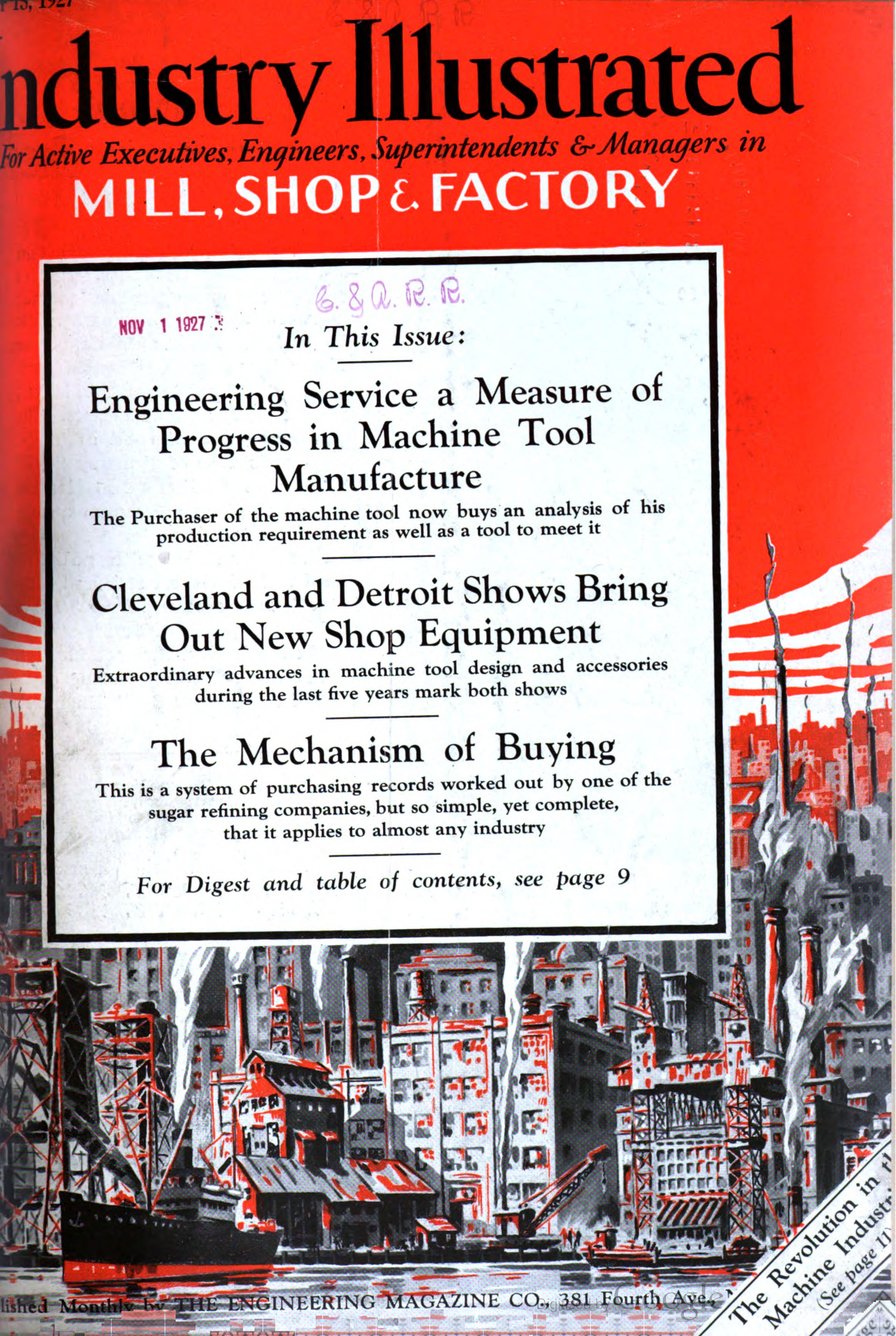
Cleveland and Detroit Shows Bring Out New Shop Equipment

Extraordinary advances in machine tool design and accessories during the last five years mark both shows

The Mechanism of Buying

This is a system of purchasing records worked out by one of the sugar refining companies, but so simple, yet complete, that it applies to almost any industry

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The Revolution in Machine Industr

(See page 11

lished Monthly by THE ENGINEERING MAGAZINE CO., 381 Fourth Ave.

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BONNEY RIGHT ANGLE *C.V. Chrome Vanadium Wrenches

*CV is a Bonney trademark registered in the U.S. Patent Office.
Chrome Vanadium registered August 11, 1925

(Patents Applied For)

BONNEY "ONLY THE BEST"



Bonney "C-V" Chrome Vanadium Right Angle Wrenches, 90 degree angle of opening, are designed for work in close quarters where it is impossible to use a 15 degree or 22-1/2 degree opening Wrench. Such places are found in work on brakes, manifolds, cylinder-heads, etc. The heads are pear shaped as in the Engineer's type of Bonney "C-V" Wrenches and the handles are shaped to give the operator a comfortable grip.

Finished in nickel with polished heads. Made in all standard combinations of openings from 5/16" to 7/8". The prices of Bonney "C-V" Right Angle Wrenches are identical with prices of corresponding openings in Bonney "C-V" Engineer's Wrenches.

Five Bonney *CV Chrome Vanadium double end Right Angle Wrenches, all neatly packed in attractive leatherette kit. These five wrenches will fit the following:

U.S. STANDARD NUTS	S. A. E. NUTS	HEX. CAP SCREWS
1/4", 5/16", 3/8", 7/16", 1/2".	1/4", 5/16", 3/8", 7/16", 1/2", 9/16",	3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8",

(In cardboard box without leatherette kit $5.05)

Attractive Discounts to Dealers

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Complete in Leatherette Case **$6.00**

You can secure from your jobber

Bonney Forge & Tool Works
Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

BONNEY Chrome-"CV"-Vanadium WRENCHES
REG. U.S. PAT. OFF.

Bonney Forge & Tool Works
ALLENTOWN, PA.

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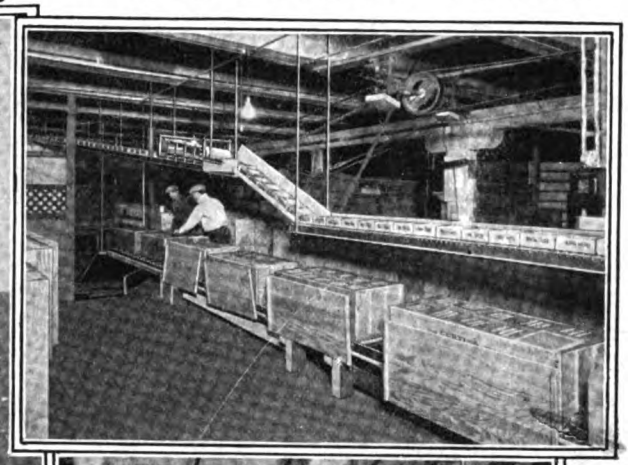
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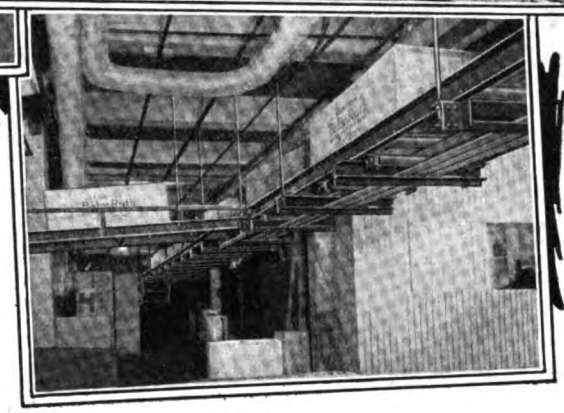
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Baby Ruth — another user







Above: Packed cartons of Curtiss Baby Ruth, "Ostrich Eggs" and Milk Nut Loaf being carried to lower floor shipping department on Logan Gravity Conveyors. *Upper Right:* Upper line of Logan Gravity Conveyors brings cartons to shipping department where they are packed in cases and nailed up while moving on lower line of Gravity Conveyors to the Logan Live-Roller Conveyor (*Lower Right*) which delivers them direct to cars and trucks.

BABY in name but giant in popularity and sales! Better ingredients, constant availability and faster deliveries are the three essentials that have made Baby Ruth one of the most asked-for candy bars in the world and lifted it away from every-day competition. Logan Conveyors have helped in all three ways. Their reductions in handling costs permit the use of finer materials. Their savings in time make possible greater production and enable the salesmen to offer fresher, more salable goods. Do any of these factors influence the success of your manufacturing and distributing processes? Bigger savings, bigger profits, bigger business—this is the gist of a new and interesting booklet, "*Seven Economies of Logan Conveyors*". Ask for it!



IT'S THE *reorders* that prove the customer satisfaction of both Curtiss Candy Company products and Logan Conveyors. Some of the most complete installations of Logan Conveyors are those of customers who started years ago with small test systems. And the constant growth of a business based on the good will of old customers is more than ordinarily gratifying.

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Your Business Property *at a fraction of the cost of hand-painting*



Savings More Than Pay for the BINKS

Portable Spray-Painting Outfit

You can spray-paint any large building regardless of surface texture, inside or outside, and more than save the cost of the equipment on the first big painting.

The Binks machine method of painting is 4 to 5 times faster than hand work. Operation is simple; requires less man power, and does better work.

In factories, Business Buildings, Hospitals, Schools, Hotels,—in fact, wherever efficient light, sanitation and the maintenance of property are essential; the ownership of a Binks Portable Spray-Painting Outfit is a dividend-paying investment.

Interesting details will be mailed to you upon request. Address:

Binks Spray Equipment Company
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Offices in Principal Cities

Spray-Painting Equipment for Every Industrial Requirement

Introducing Our New Departments

BEGINNING on page 57 of this issue, our readers will find the first four departments announced last month. They are: 1. Shop Department; 2. Power Department; 3. Materials Handling Department; and 4. Plant Maintenance Department.

These departments will contain brief and informative articles by authorities in each field—articles which can be read in a few minutes. They will contain brief descriptions and photographs of machines, methods and materials which are just being placed upon the market or which have been improved to such an extent that they are new machines for all practical purposes.

In addition to these, it is our intention to throw open the department space to our readers for the discussion of debatable methods, with the expectation that a thorough airing of conflicting opinions may help to establish standard methods in place of debatable ones.

We invite our readers to contribute their ideas and suggestions so that we can make these departments of the greatest practical use. We also invite contributions, particularly short accounts of practical experiences in the field covered by each department. All ideas, suggestions or experiences accepted and printed will be paid for provided they are written exclusively for INDUSTRY ILLUSTRATED.

Morgan G. Farrell
Editor.

Industry Illustrated

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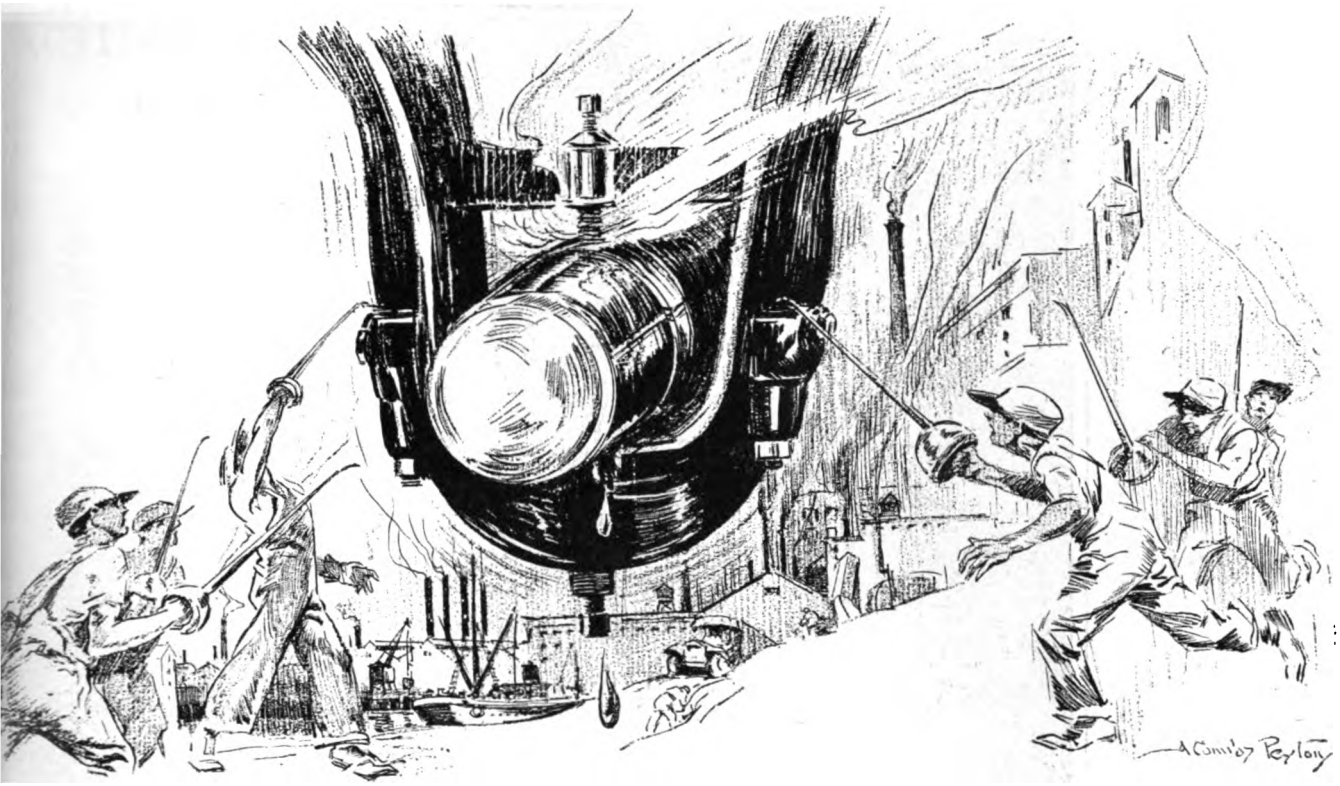
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Is friction the trouble-maker in your plant?

When the power plant struggles under its dragging load, when plain bearings get hot and constantly cry for oil, when production slows down and repair costs go up—you can usually depend on one thing: Friction's tell-tale hand is at work.

A few years ago in the plant of a Chicago manufacturer,* excessive power load, together with high maintenance and repair costs arising from plain bearings on line shafting, were shooting overhead skyward. Then, Skayef Self-Aligning Ball Bearing Hangers were installed. When the savings on Skayef hanger equipment were compiled, this manufacturer found that his no-load power consumption was cut 30%. Oiling labor was reduced from twice a day to once a week, and repair costs practically eliminated. Furthermore, Skayef Ball Bearing hanger equipment paid a return of 59% on the investment.



Put your problems up to SKF. We offer you the full cooperation of a competent staff of engineers ready to assist you in reducing excessive overhead.

*A copy of a certified survey giving other itemized savings in this plant will be sent free on request. There's no obligation.

1891

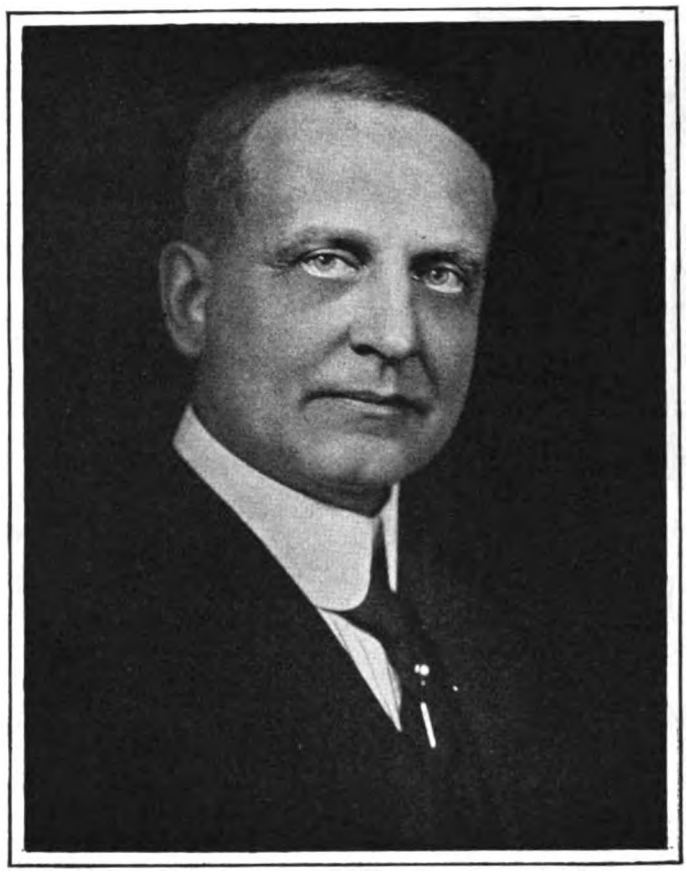
SKF

MARKED

elf-Aligning **HANGERS** *Ball Bearing*

SKF INDUSTRIES, INC. ~ S. E. cor. Madison Ave. at 34th St. ~ NEW YORK CITY

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MR. HERBERT W. RICE, *President of the U. S. Gutta Percha Paint Co., Providence, Rhode Island—makers of the famous Barreled Sunlight*

Out of an experience of 40 years

HERBERT W. RICE

discusses a prevalent fallacy about costs in interior painting

"TWO milestones of industrial painting have been reached and passed in my experience. First—the universal recognition of *white* paint as desirable for better light reflection. Second—the demand for high grade *gloss* paint that resists dirt and thus assures lasting cleanliness.

"But on one extremely important point there is still a surprising lack of real understanding. That is the question of painting *costs*.

"Many paint buyers have been led to believe that the price of paint by the gallon is the determining factor in the cost of painting. This is a fallacy.

"Simple tests will show that the spreading and covering powers of paints, and the amount of labor required to apply them, differ. With a paint that covers more surface and can be put on in a shorter time, naturally there is less paint and less labor to be paid for.

"In other words, the real cost is the cost of the surface when coated, not the cost of the paint in the can.

"Hence in estimating costs today every painting dollar must answer these two questions:

(1) *How large an area will it cover?*

(2) *How much labor is required?*

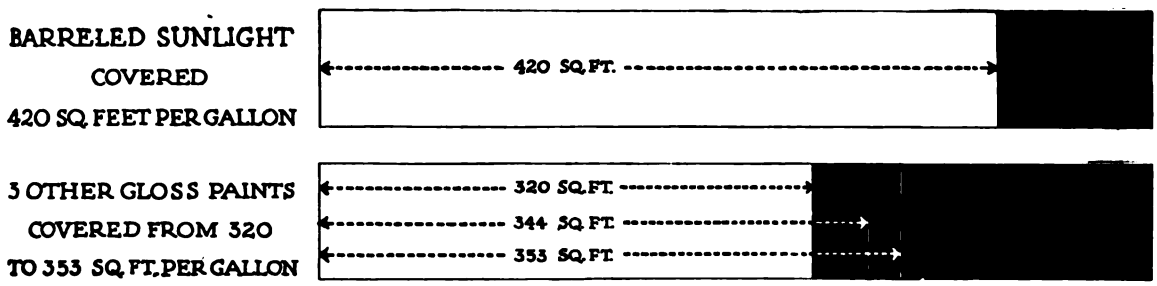
"Some actual figures on these two points were recently brought to my attention. They are given on the opposite page. I found them convincing, and I believe they will interest you."

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ACTUAL TESTS SHOW THAT BARRELED SUNLIGHT COSTS LESS ON THE FINISHED JOB

The diagrams following have been made to illustrate the figures resulting from a contractor's actual experience in using Barreled Sunlight and three other gloss paints

1—LARGER AREA COVERED

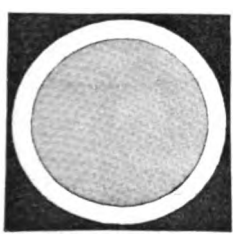


This greater spreading power of Barreled Sunlight is the factor which brings the actual cost for the total amount of this superior paint used down to the cost level of paints lower priced per gallon

2—LESS LABOR REQUIRED



The same painter required the longer time specified above to cover the same number of square feet with each of three other gloss paints than he required with Barreled Sunlight. This saving in labor time is another important factor that reduces the actual cost of Barreled Sunlight on the finished job

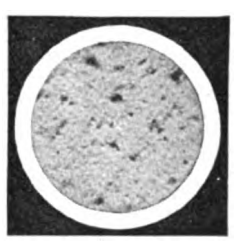


Barreled Sunlight

. . AND LASTS LONGER WITHOUT FREQUENT REPAINTING

The microscope shows why

These photographs of paint surfaces were made through a powerful microscope. Each paint was magnified to the same high degree. The astonishing contrast shows one reason why Barreled Sunlight lasts longer without repainting. Smooth and non-porous, it resists dirt and washes like tile.



Ordinary Flat Finish White Paint

Barreled Sunlight

Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

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U. S. GUTTA PERCHA PAINT COMPANY
5 Dudley Street, Providence, R. I.

Please send us your booklet on the use of Barreled Sunlight in painting industrial interiors—also a panel painted with Barreled Sunlight.

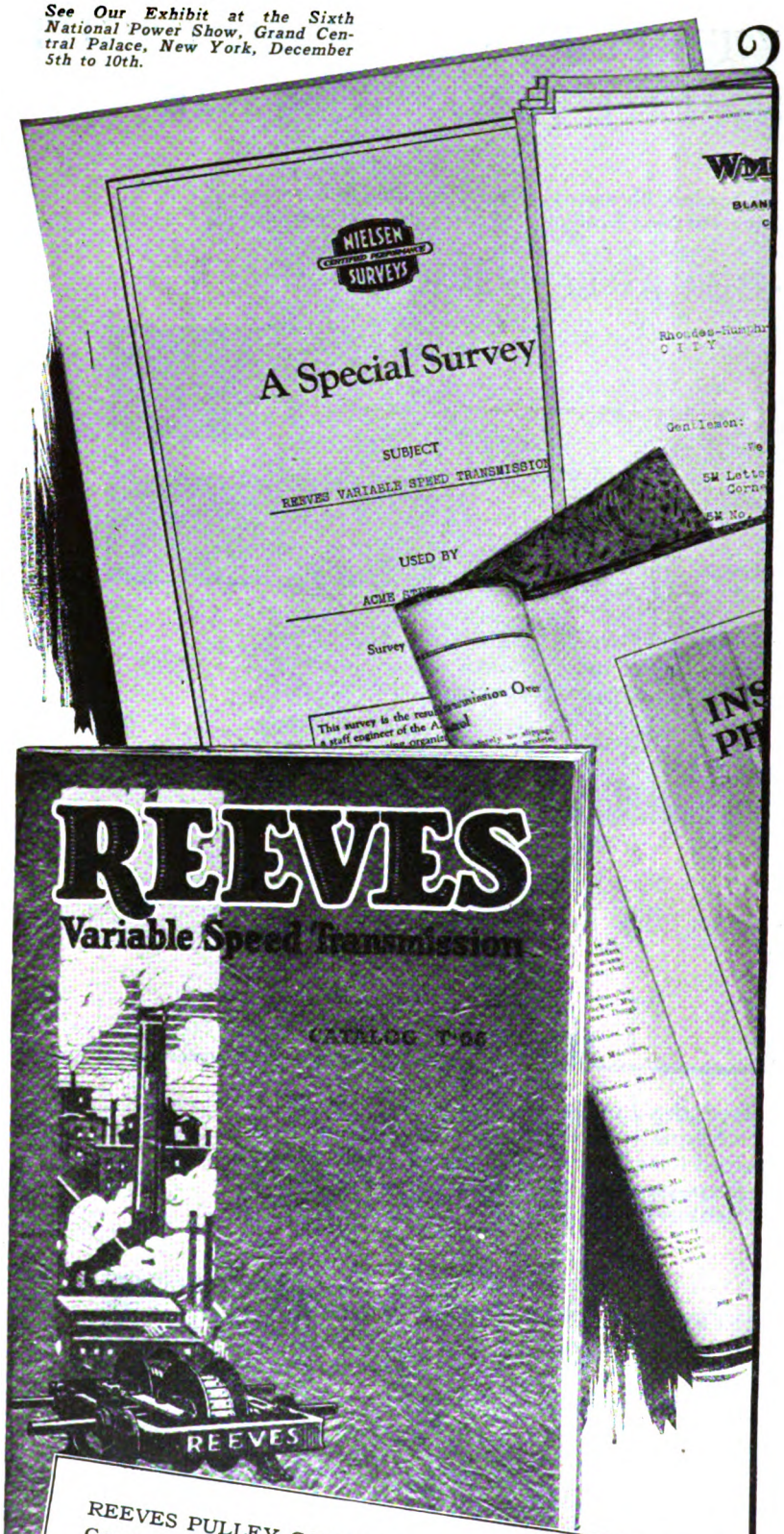
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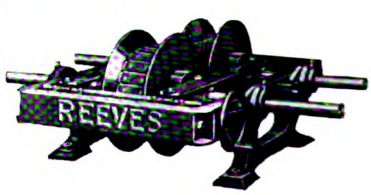
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SAVINGS of thousands of dollars—improved production of product—economies in time and labor—these are advantages which variable speed control has brought to other manufacturers in *your own industry*. And we can quickly tell you why and how.

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And all this information is available for you. It will show you production advantages and economies that variable speed control will bring *you in your plant*. It will show you why so many other manufacturers in your industry declare that speed control is *absolutely vital!*

The coupon below will bring you this information by return mail. Just name your industry, and we will send you the facts.

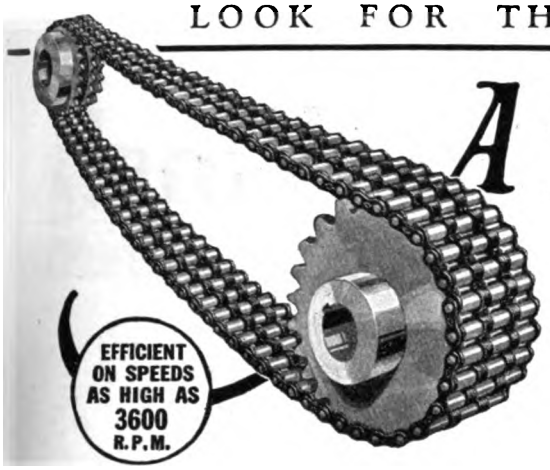


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Variable Speed Transmission

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ANY understanding of roller chain which classifies this highly efficient form of transmission as a slow speed drive only, is—to speak most kindly—a *misunderstanding.*

For such a notion ignores the great engineering strides that have made the modern Diamond Roller Chain Drive a thing so different from the roller chain drives of ten years ago.

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Rolling Surfaces ◇ *Discourage Wear*

DIAMOND CHAIN

ROLLING ~ AT POINTS OF CONTACT

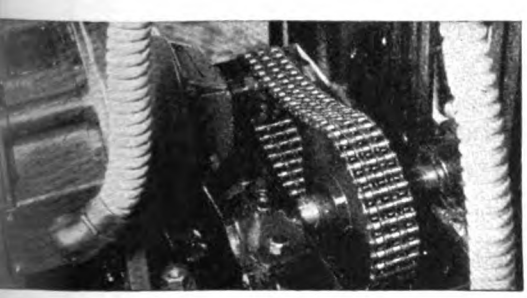
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7½ H. P. motor drive—1760 r.p.m.—reduction of 2 to 1 on 10" centers—using triple strand Diamond Roller Chain.

The booklet, "Rolling the Problems Out of Transmission", pictures and presents a full description of this highly efficient chain. Use the coupon.



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LINCOLN ARC WELDING PRIZES FOR 1927

1st Award	- -	**$10,000**
2nd Award	- -	**$ 5,000**
3rd Award	- -	**$ 2,500**

This competition is to be judged by the American Society of Mechanical Engineers and complete information regarding the contest can be obtained from the society headquarters.

Briefly stated, these awards are to be given for the best papers describing applications of arc welding which will result in the greatest good for humanity. Anyone, in any country of the world, may compete.

For a booklet describing the conditions governing the award of these prizes, address the American Society of Mechanical Engineers, 29 West 39th Street, New York City, or the Lincoln Electric Company, Cleveland, Ohio.

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Industry Illustrated

For Active Executives, Engineers, Superintendents and Managers

In Mills, Shops & Factories

JOHN R. DUNLAP and MORGAN G. FARRELL *Editors*

W. THOMSON LEES *Associate Editor* ADOLF SCHILDKRAUT *Art Director*

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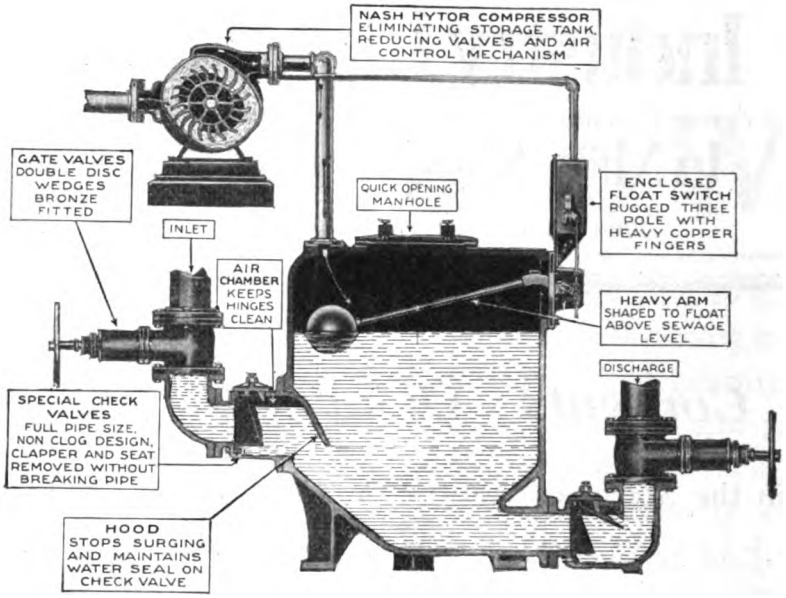
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Sectional view, showing the Jennings Sewage Ejector discharging

No complicated air valve mechanisms in this sewage ejector

PRINCIPLE OF OPERATION

Sewage, under the action of gravity, flows through the inlet check valve into the pot. As it accumulates it raises a ball float, which, when the pot is full, actuates a float switch, thereby starting up the Nash Hytor Air Compressor.

Compressed air is delivered into the top of the pot, closing the inlet check valve and expelling the sewage through the outlet check valve. When the pot has been emptied, the float, having reached the lower limit of its travel, opens the float switch, stopping the compressor, through which, then, the air in the pot is vented. Sewage again flows by gravity into the pot, repeating the cycle.

One thing you will find about the Jennings Sewage Ejector is its freedom from complicated air valve mechanisms, screens, separators, air storage tanks, reciprocating compressors, submerged or inaccessible parts.

Simplicity is its outstanding characteristic—simplicity in design and in operation. There are only two principal parts to the unit—the motor driven Nash Hytor Air Compressor, and the blow pot, with the necessary valves, pipe, connections, and automatic control. Operation is dependable—unfailingly so.

Write for our bulletin, which gives complete information. Please use the coupon.

NASH ENGINEERING COMPANY
92 Wilson Road So. Norwalk, Conn.



Jennings Pumps

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☐ Please send copy of Bulletin No. 67, JENNINGS SEWAGE EJECTOR.

☐ Also your recommendati ing.....g.p.m. against.....ft. head.

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The REVOLUTION in The Machine Industries

By J. F. Lincoln

Performance buying—new uses of materials, — better sales methods — will mark the policies of successful makers of machine tools in the immediate future.



Photo Bachrach

J. F. Lincoln
Vice-President and General Manager
The Lincoln Electric Co.

I HAVE often been asked what were the motives behind the offer we made in the technical and trade press to buy any machine or process which would pay for itself in two years.

Well, the most obvious motive behind an offer of that kind is ordinary good sense. If a bond issue bearing six, seven or eight per cent. interest is put upon the market, there is a general rush to buy it provided it is properly secured. Then, why shouldn't any one make the offer my company made. In effect, it is a tender to purchase anything within the limits described, which will return us fifty per cent. on our investment.

Actually, however, there is something more behind the offer. It is an expression of our conviction that the one correct principle upon which shop equipment should be purchased is performance—that is, rate of return on investment. And this brings me to the consideration of one of the revolutionary changes in the machine tool field which is now well on the way to realization.

Under the now nearly obsolete system of selling, manufacturers have been in the habit of spending say, twenty-five per cent. of the cost of producing a machine, in breaking down for it, what is known as sales resistance. Why this expressive term should be used to describe the state of mind of the man who wants to buy and who is offered a machine which will suit his needs, is beyond my comprehension. What is he resisting? A perfectly satisfactory machine which is demonstrably capable of doing the work expected of it? A feeling within himself that he should not spend the money right now? Or a suspicion that the veracity of the salesman who is offering him the machine is not as perfect as it might be.

I daresay that under the system of selling, which is now rapidly passing away, the last element may have been an important part of "sales resistance." It sometimes seems that salesmen spend a great deal too much time in running down the other fellow's product with unnecessary vindictiveness and in making claims for his own with equal extravagance. It is quite certain that they spend a great deal of time—and money—in making superfluous trips and in wining and dining prospects who would probably prefer to be at home in bed. All told, this expensive system of overcoming a resistance which should not exist at all, amounts to a grave, annual, economic loss.

Why would it not be a sounder idea, instead of depending upon fluent salesmen who are more than likely to

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turn the very faults of the machine into merits—to let the machine sell itself? That is to say, instead of extolling the beauty of finish, the frictionless bearings, the graduated swivel heads and what not, why would it not be more illuminating to present the prospect with a certified performance record of the machine in operation?

There is nothing unprecedented about the performance record. Ask any production manager about the output capacity of any of his machine tools when running a certain part; ask him what is the power consumption of the tool when operating at that capacity; ask him the amount of operating and cutting lubricant; ask him for the repair record of the tool. He will pull a card out of his file, giving you that information and anything else you might want to know about the particular machine. The same applies to performance records of new machines, except that the output will probably increase as the machine becomes more limber through use. The repair account, of course, remains problematical.

Tests Are Available for Home Use

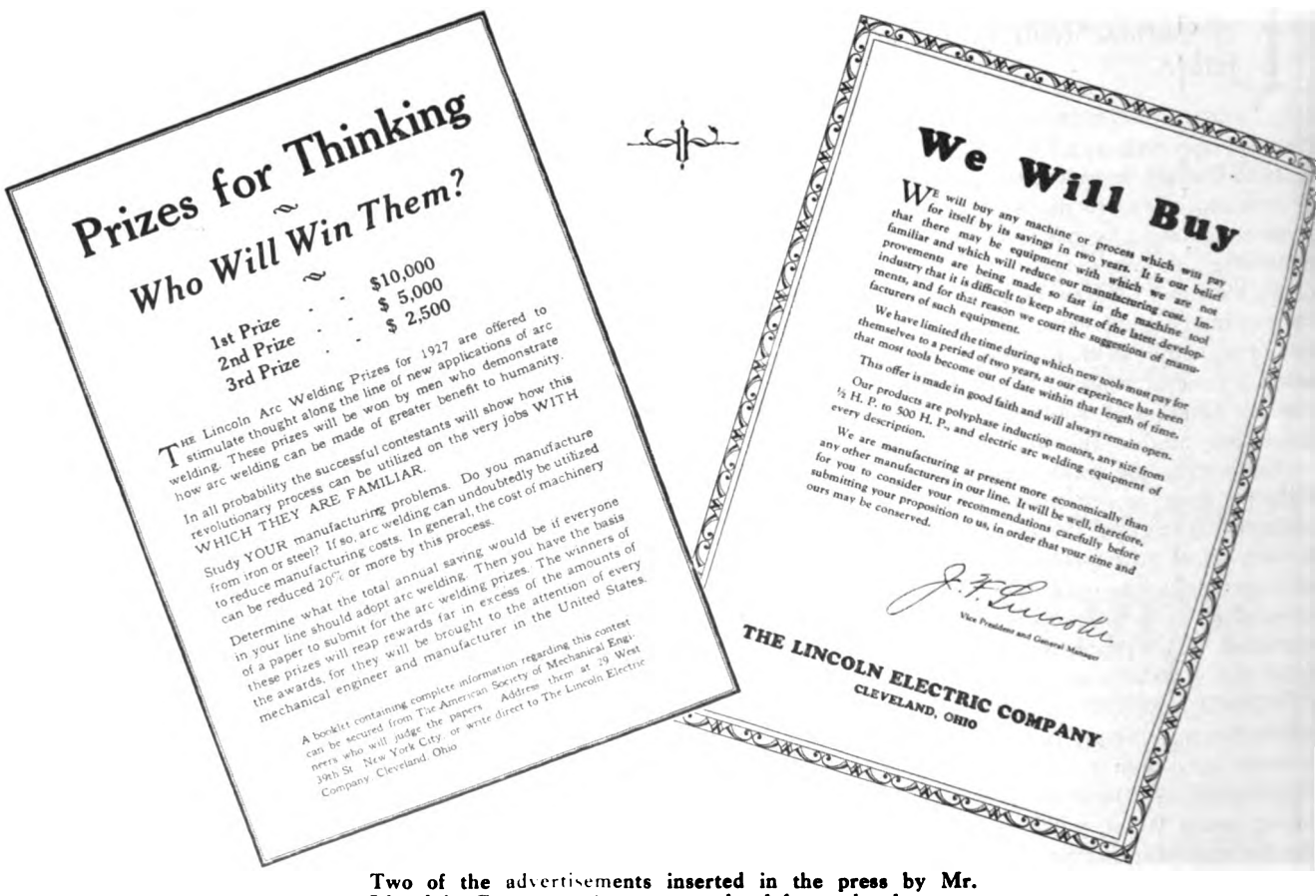
At any rate, the machine manufacturer has such tests and records made for his own engineering department. For some reason, they seldom reach the sales department; and if they do they are used even more rarely. Yet there is a strong and growing tendency among buyers, both big and little, to emulate the example of the purchasing power of the automobile manufacturers; namely, to demand such a performance record. In fact, this particular radical change in the ways of industrial business is traceable directly to the influence of the motor car industry—like a good many others. Here, at least, is one place where the purchaser asks not "how much will it cost" but "what will it do." The cost accountants will soon find out how much it will cost, if they had not already found out. It is the cost per cut or the cost per part or the cost per hour, which interests the production manager of an automobile plant. Whether the first cost of the machine is $10,000 or $1,000 is of relatively little interest to him. Performance, not price, is his unit of measure.

Standardization Authority Must Be Set Up

We may assume, then, that the performance basis of purchasing will shortly become universal. The next question is, who is to determine the performance of the machine and who is to guarantee that the performance figures issued are correct. Finally, who is to work out a standard program and method of test and a standard for reporting the results of such test. I am not prepared to say, offhand. Undoubtedly, in most cases, the manufacturer's word will be sufficient guarantee of the correctness of the figures he presents; but, even so, there must be some standardization of practice so that the figures of performance for a tool made by one manufacturer may readily be compared with those of another. And again, the more honest a manufacturer is in his statements of performance of his products, the more willing he is to have some competent authority certify to them.

Consequently, it would appear to be the most workable plan to have the form of the tests worked out, much as the standard boiler test has been worked out, a great many years ago, by an impartial body.

Whether such a body should be chosen by the manufacturers' associations from among their own member-



Two of the advertisements inserted in the press by Mr. Lincoln's Com... e one on the left to develop new applications ... he other to encourage buying on ...formance.

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ship or whether the engineering societies would offer more varied talent and experience, is a question for the manufacturers who believe in the soundness of performance sales as a principle, to decide.

Honesty and ability in the deciding authority are the chief requisites for making the plan effective. The mechanism can be worked out.

This system, by its effect upon sales methods, would equally influence those of purchasing. When the salesman comes in prepared to talk performance to a purchasing agent, the latter must know something about the performance of the tools already in the plant. In a thoroughly modernized factory, this information will have been collected in standard form by the production department for the purchasing agent. It is then optional with the plant officials whether to leave the comparison of the new machine with the old one, to the purchasing agent, or to refer it back to the production department.

This is going to lead to another economy in favor of the buyer of new machines, especially if he has not been keeping adequate performance records. Since he will now be compelled to keep them for comparison with those of machines newly perfected, he is likely to discover what a great many others have found out in a similar position to it. Namely, that the performance of his machines is away below par even for them. Instances are on record, of considerable increases in plant output, made possible by speeding up machines which were discovered to have been giving short delivery.

Performance Tests Will Affect Design

The general recognition of the performance plan of purchasing will, moreover, have a profound effect upon machine design, and the materials of construction, especially when coupled with newly discovered processing methods. It is a fact that the machine tool industry, for one, has taken more keen recognition of new materials and manufacturing methods made available to them during the past five or six years than at any time during their previous long and conservative history. Here again, the automotive industry has set the pace. Nothing will do the car manufacturer but the latest in bearings, motive power, alloy steel aluminum castings, lubrication and ignition systems. As this year's Exposition showed, the machine tool manufacturer has not been slow to take a leaf out of the motor car builder's notebook. He has taken over most of the new developments bodily. I shall not go into details, as I understand that these advances in machine tool design will be fully discussed in another article in this issue.

I would, however, mention one of the most recent and far reaching changes in the structure of machines made possible by the development of electric welding. When the arc welding process first became commercially available, my company was making electric motors in which the heavy, old-style, cast-iron frame was used. Convinced that we could effect considerable manufacturing economies by substituting steel at two cents a pound for cast iron at six, we began to study the problem of redesigning our motor frames. The result has been that the frames are now built of rolled and welded structural angles with light distance bars and with pedestals also built of welded angles. The motor rails which were formerly made of cast iron are now made of steel angles. One size of rail weighed 77 pounds in cast iron and cost $5,109. The same rail and steel weighs 66 pounds and costs $2,153. An additional advantage is that it is possible to weld a small angle inside the rail to keep the bolts from dropping down when the nuts are removed. With the cast-iron rails, it is necessary to remove the rail in order to get at the bolts.

This striking economy led us to study our entire product with a view to an analysis into parts which could be welded. The results were sometimes amusing as well as instructive. In one case, we were using a cast iron barrel for the frame of a small exciter. It cost us eight cents a pound. We made the most obvious substitution for it, namely, a length of rolled, steel pipe. This cost us four cents a pound. Finally, we decided to see whether we could roll the frame out of bar-stock and weld it more cheaply. It cost two cents a pound.

At another time, we decided to weld copper induction bars into the copper end rings. At the same time, a set of brass bars and rings was to be tried out. Knowing all about welding, in those days, I told the foreman not to weld the brass bars into the brass ring as brass could not be welded. Through some error, the brass bars and rings were delivered to the welding booth and there, *duly welded.*

It is, of course, impossible to enter into a discussion of the value of welded steel as a substitute for cast-iron, without evoking loud cries of protest. Nevertheless, there is a place in industry for castings and another place for welded steel units. It is entirely a matter of cost which decides whether one or the other is to be used for any special purpose. And this cost is not merely that of the poundage of material used in the part, but the total cost including drafting and design and shop operations, as well as subsequent storage and handling.

Where Welding Makes for Real Economies

Let us trace through, by way of comparison, the creation of the cast-iron motor frames previously referred to and compare it with that of the welded steel frame. To begin with, we must have a drawing of the finished casting. From this we must make a pattern, cores and core boxes. From this, in turn, we must make the mold. Finally, we must pour the casting. All this requires a fairly well equipped wood shop, a foundry with cupola, blowers, traveling cranes, hoists, core ovens and flasks. We are not through yet. We have to handle and find space for tons of pig iron, core and molding sand, scrap, flux, cordwood, fire-brick and supplies. All of this represents a respectable investment in buildings and equipment; and we have just gotten the casting out of the foundry. Now it must go to the tumbling barrels, grinders and air-blast in the cleaning room, after which it must go to the pickling house. More investment—more expense. As the casting starts on its way to the machine shop to be finished, the pattern is brought to the pattern storage house. From then on, it is handled back and forth many times, until it is finally no longer fit to use. Meanwhile, there is spoilage on the casting floor—five per cent. or fifteen per cent. as the case may be—breakage in handling, machining or assembling.

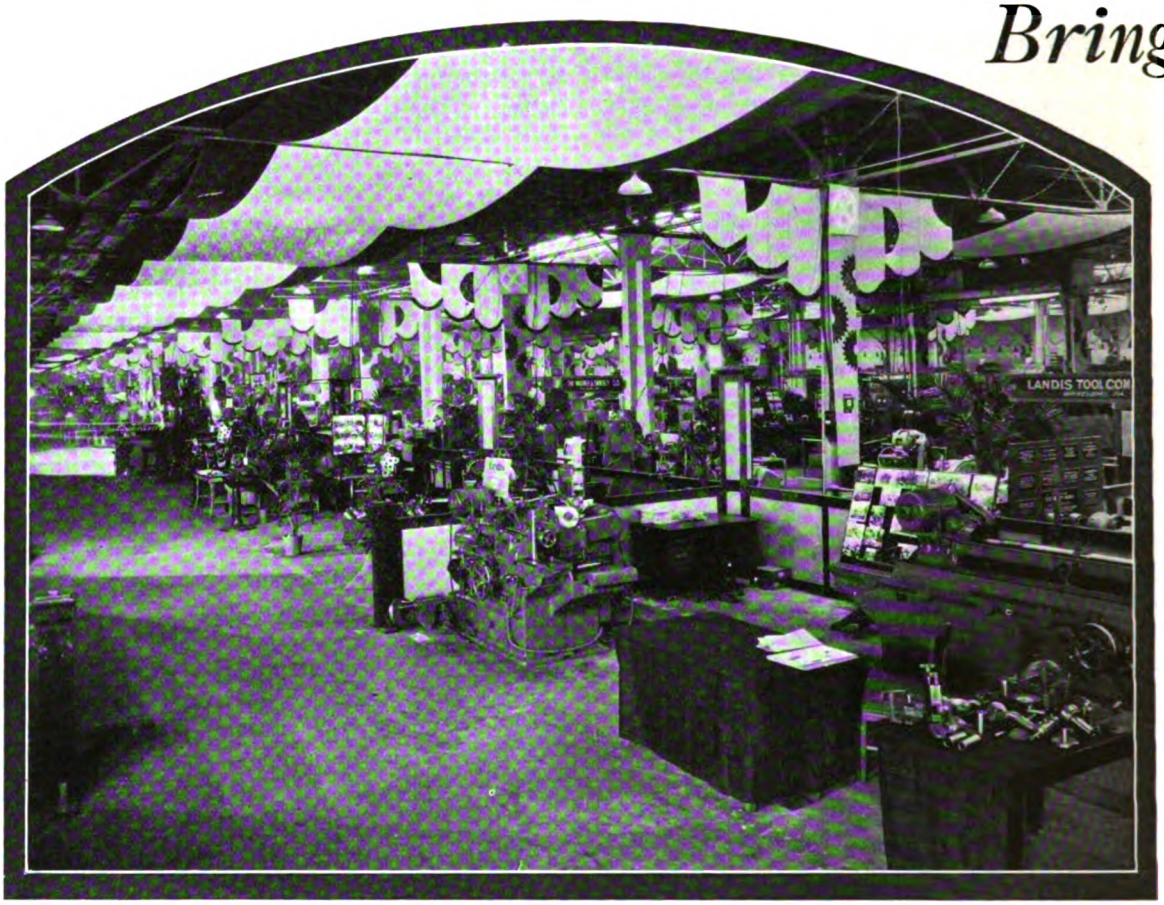
On the other hand, what does the operation of assembling the welded frames consist of? A plate must be trimmed, rolled and welded together with certain angles, or the angles alone rolled and welded, according to the frame. Distance bars must be sheared and welded in place and that is about all there is to it. The frame is

(Continued on page 34)

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CLEVELAND a

Bring



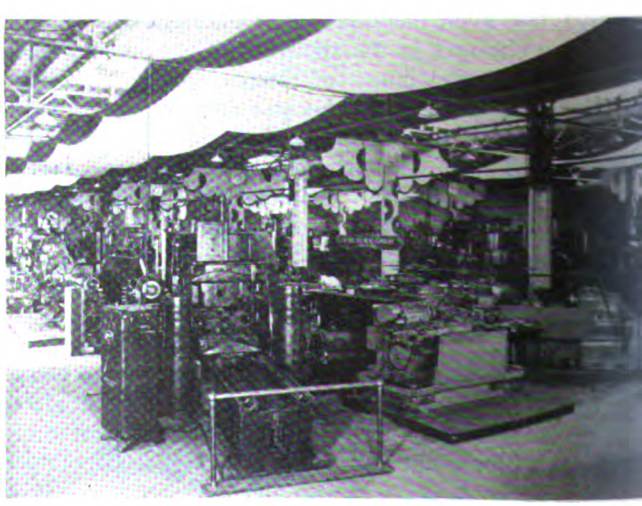
BETWEEN ten in the morning of September 19th and six in the afternoon of September 23rd, approximately seventeen thousand people viewed the exposition of the National Machine Tool Builders' Association in Cleveland. They saw about two and one-half acres of floor space in the Auditorium Annex and Arcade devoted to a showing of highly developed machinery, unequalled by any other such exposition.

Those who have observed the attendance at othe shows of a similar nature in former years were struc by the intense earnestness of the audience at this on These men came from all parts of the country and re resented not the machine industry alone but every larg class of industrial business in the country. The registra tion lists show representatives from the United Stat

(*Continued on page* 36)

The three views on this page were taken at the National Machine Tool Builders' Exposition. They show graphically the enormous strides which have been made in the design and equipment of machine tools. Pick out any machine and compare it with one of ten years ago.





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ETROIT SHOWS
w Shop Equipment

Expositions of the National Machine Tool Builders' Association and of the American Society for Steel Treating are revelations of the progress in the design and manufacture of tools, steel and heat appliances since 1921.

THE American Society for Steel Treating held its Ninth Annual Convention and Exposition in Detroit during the week of September 19th. The technical papers were read at the morning and afternoon sessions at the Hotel Statler. The exposition was open for visitors after twelve o'clock.

From the standpoint of the number and extent of the exhibits, those illustrating the different systems of welding and the various classes and kinds of heat treating furnaces and retorts were most useful. All the standard forms of electric spot welders and butt-welders were exhibited together with the principal forms of arc welders. There was an extensive showing of almost every conceivable type of oxy-acetylene burner and equipment together with the latest developments in pure metal and alloy welding rods, particularly those intended for relatively low temperature welding.

A feature of the electric

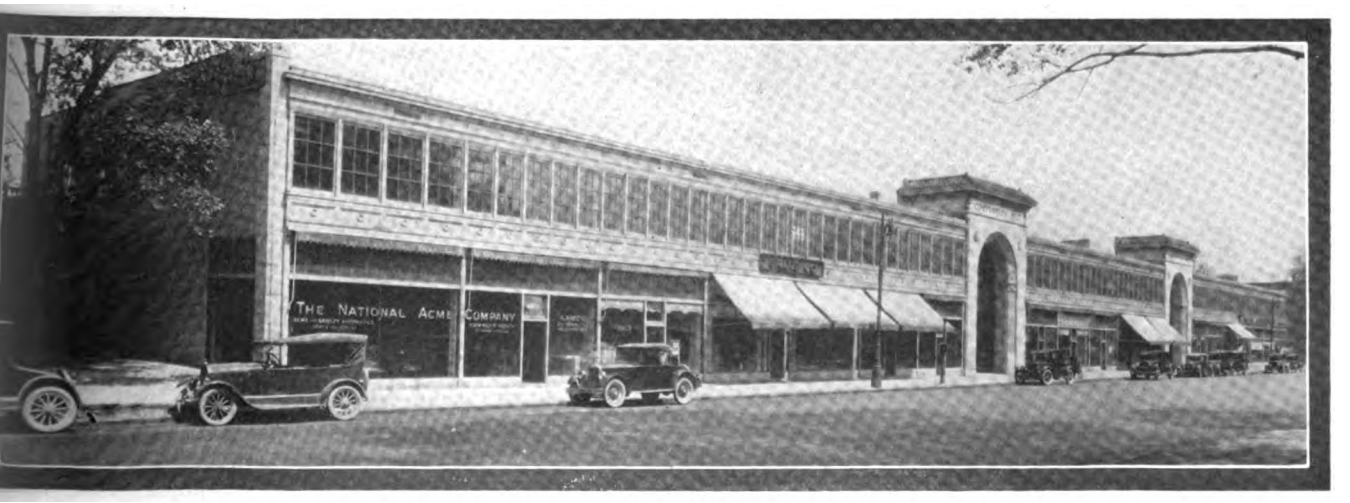
(*Continued on page* 38)







These photos illustrate the exposition of the American Society of Steel Treating at the Convention Hall in Detroit. They show some of the machinery exhibits as well as those of steel and heat treatment furnaces.



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Engineering Service a Measure of Progress in MACHINE TOOL Manufacture

The rapid growth in demand for specialization in the design and construction of machine tools has brought with it a demand for engineering service by the manufacturer of tools of which customers should avail themselves.

By Frederick B. Heitkamp

ENGINEERING Service in connection with the use of machine tools has in one shape or another always been present. However, it was not until some fifteen years ago that engineering service on a really scientific and intensive scale was started. For many years standard machines, many of these being of old design and of design of long standing, were used both for tool room and manufacturing shops. With the advent of increased competition and demand for improved methods, there came a trend toward semi-special or special machines, and a decided improvement in the standard machines put out by the machine tool builders. At the same time there came a trend toward specialization in the manufacture of machine tools. The effect of the automobile industry on the machine tool industry cannot be overlooked. On the other hand, the tremendous improvements contributed to the manufacture of automobiles by builders of machine tools have been the source of much comment. The leadership of the automobile industry in improving existing machine tools and methods was soon followed by other industries so that there came a demand for real engineering service with regard to installation and operation of machine tools. A number of companies many years ago instituted service departments for the sole purpose of endeavoring to improve the manufacturing methods of their users and at the same time to bring about suggestions for improvements in their own product for all fields.

Types of Service

This engineering service embraces several forms. The most direct and most efficient way perhaps in which service can be rendered to the user of the machine tool is to have an experienced and qualified engineer of the machine tool manufacturer go directly to the user's plant, make his analysis and survey on the ground, where he can become thoroughly familiar with all of the details in connection with the operation and its preceding and succeeding operations as well. If the engineer is competent a definite time study and recommendation can be made

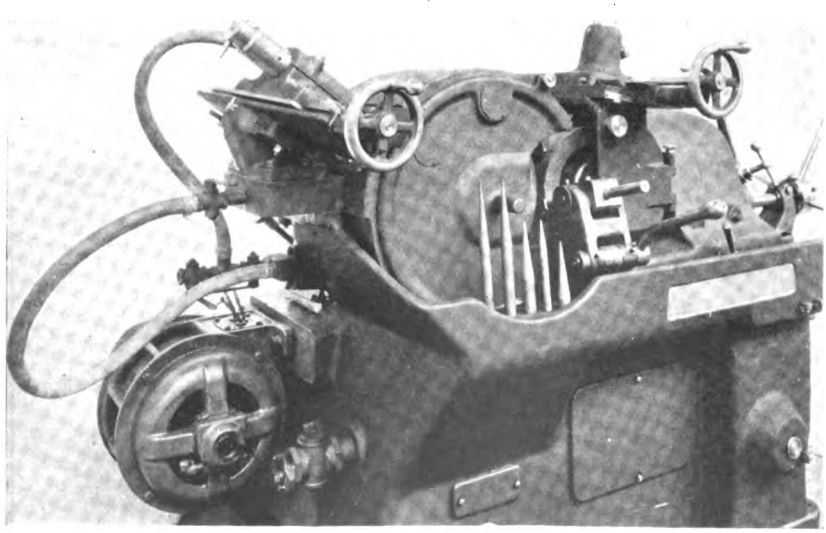


Fig. 1. The centerless grinder has brought about revolutionary changes in the grinding industry. In one plant alone, one of them is returning 400 per cent. annually on the investn

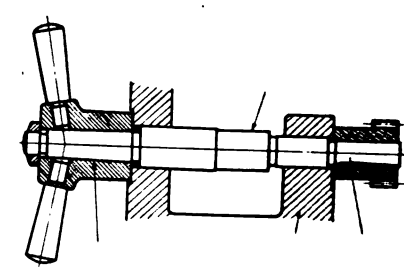


Fig. 2. The same complicated form of a small part when ground in the ordinary way.

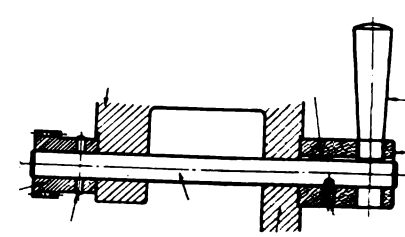
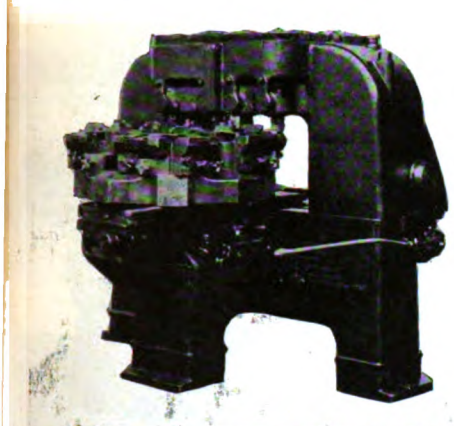
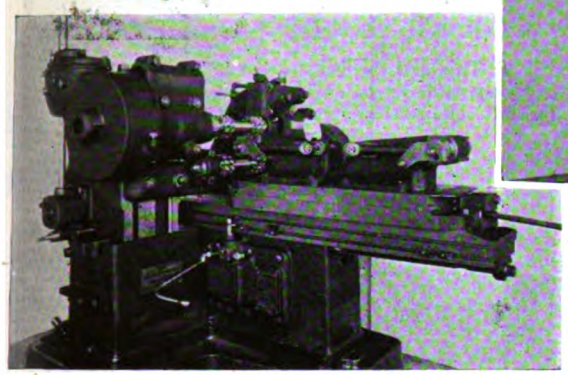


Fig. 3. This was re-designed for centerless grinding with a resultant saving equivalent to a production manager's salary.

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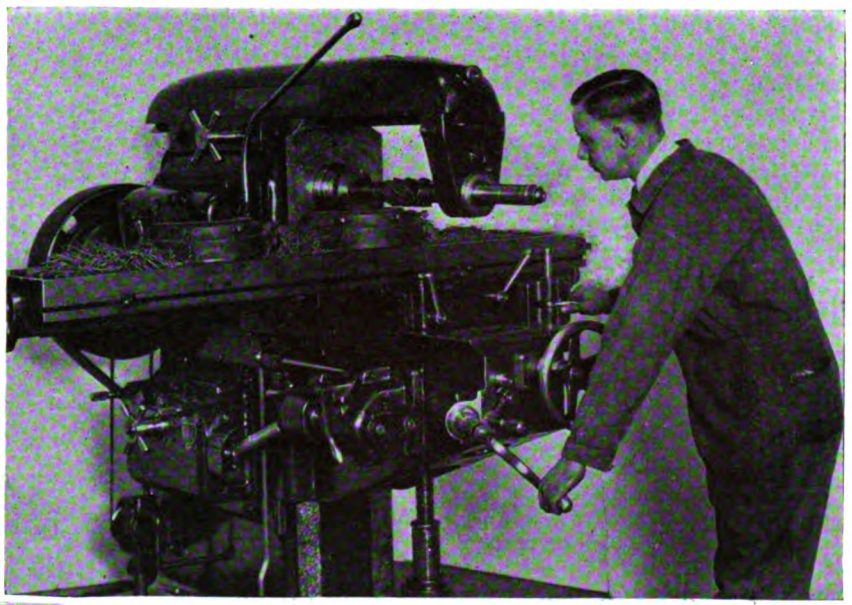


Fig. 4. Upper left: A milling machine tooled up for work in 1916.

Fig. 5. Lower left: A later type of automatic fixed bed miller, a product of 1924. A standard milling machine with special heads and special fixtures, which effect a decided reduction in machining time.

Fig. 6. The 1927 model milling machine has few standard parts. It is, in fact, an entirely special machine.

and the improvement followed through to a definite conclusion. This can be either through the speeding up of the present equipment, or through the recommendation of the construction of a simple jig or fixture which in conjunction with the present machine could materially increase production. In many cases it may result in the recommendation of an entirely new machine, which through its tremendously increased productive capacity would be able to pay for itself through savings made in a comparatively short length of time. In some plants definite periods have been set for this factor, and it ranges from two to five years.

Another type of service is that, where the manufacturer sends in his blue-print or sample part, together with his engineering data, which is required for an intelligent estimate or analysis, and the complete recommendations are studied over by an engineering service department at the machine tool builders plant and written recommendations sent out in the form of a carefully prepared estimate and time study.

The third method is that of having the engineer of the manufacturer visit the machine tool plant and by putting before him complete data on similar operations in other plants, and where he can be free from the details and abstractions of his own duties at home so he can give careful thought and consideration to his problems and arrive at some satisfactory conclusion and recommendation. No matter which one of these three types of service is employed, the fundamental object is the same, the improving of existing machining methods —to decrease costs and to increase profits.

Results Obtained

During the last few years especially, a much better understanding has arisen between the manufacturer and user, and the builder of machine tools. Problems of each have been carefully understood by the other and this has been brought about to a great extent through the intensive application of this engineering service about which we have been speaking. Users have contributed very valuable ideas for the improvement of machine tool methods; machine tool manufacturers on the other hand have been instrumental in tremendously increasing production and decreasing costs. All of this has brought about a speedier progress in design; has brought about better methods for the user—many times the institution of a special efficiency department is in his plant. Time studies have been made by manufacturers who thought for many years that they were not large enough to give careful analysis of this kind to their work. Special outside engineering services have developed, many of them of very excellent character, which have analyzed certain installations and have showed very satisfactory returns on the investment—all of this service of whatever source, has led to a new spirit on the part of manufacturers to give careful thought and analysis to their existing methods, to see if they could not be improved. Machine tool builders on their side have incorporated automatic features on standard tools; have brought out new types of tools, and have developed new methods of machining

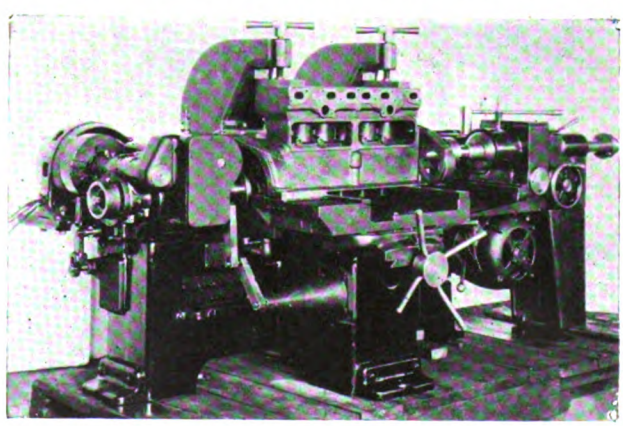


Fig. 7. Special machine for milling bosses of bearings and cam-shafts.

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entirely. Fig. 1 shows a centerless grinder which within a very few years has revolutionized the art of grinding. In many shops, thousands of dollars have been saved annually, and in even smaller shops the machine is operated but one or two days a week and still pays for itself. In the plant of a manufacturer of lathes, in Ohio, one of these centerless grinders is returning 400 per cent. annually on the investment. Changes in the design of parts in order to go on this machine have been outstanding. Figs. 2 and 3 show two such parts—Fig. 2, the structure of the part before being ground on a centerless, and 3 showing the part redesigned for centerless grinding. On this small part alone the manufacturer saved several thousand dollars annually. This is typical of the sort of strides which are being made in machine methods.

Improvements Noted

Fig. 4 shows an example of a milling machine tooled up for a milling operation in 1916. This was considered very good practice at that time, and as will be noted a standard machine was used and no particular attempt was made to incorporate any highly productive automatic features. Contrast the next illustration, Fig. 5, a fixed bed automatic type of machine which became popular, and is now in extensive use throughout manufacturing industries both in this country and abroad. This is an automatic fixed bed type of machine, equipped with an index base. With this method the operator is able to load at one end of the base, while the parts are being milled at the other; therefore, his loading time is free, and the small fraction of a minute required to return the base, index it, and have the table advance again to the cutters, is the only waste of time, so called. Dogs automatically control the table movement and all that the operator has to do, is to load and unload the work. Machines of this character at first were installed largely in the automobile industry, but soon came to be used in the electrical and general manufacturing fields.

In 1924 still further improvement was noted—this time with the introduction of special heads and special holding devices. Here again the standard machines were used, but through the application of these special heads and special fixtures decidedly lower machining time was made possible. The advantage of an arrangement of this kind is soon recognized, for should the design change or the particular method in mind be rendered obsolete the jigs and fixtures and special heads can be removed and the standard machine remains available for any other type of milling operation.

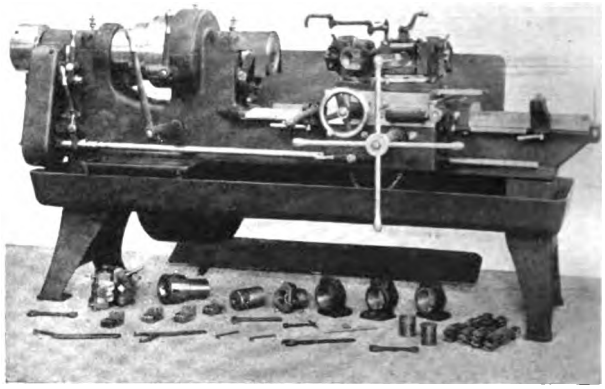


Fig. 8. This and the illustration below show the progress made in the engineering design of turret lathes. The above machine was built in 1917.

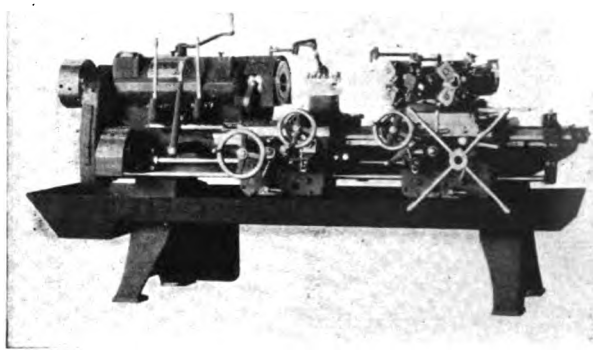
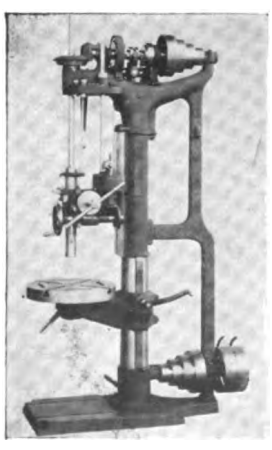
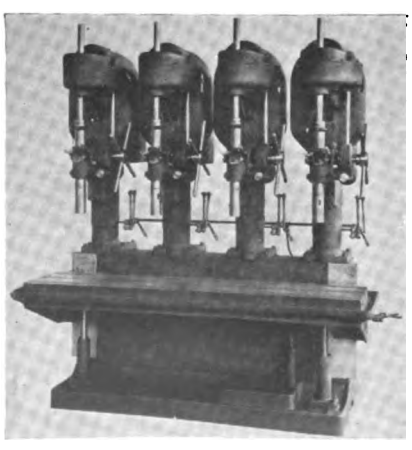


Fig. 9. This turret lathe of today contrasts with the above design as strongly as a 1927 model car with a 1917 design. It has new production features which the old one has not.

Nineteen twenty-seven methods are admirably illustrated in Fig. 6. Here we have an entirely special machine; there are a few standard parts used, but on the whole it would not be recognized by the manufacturer as qualified to be in his regular line of standard products.

The sizes which have been noted in the improvement of the milling machine field are paralleled also in that





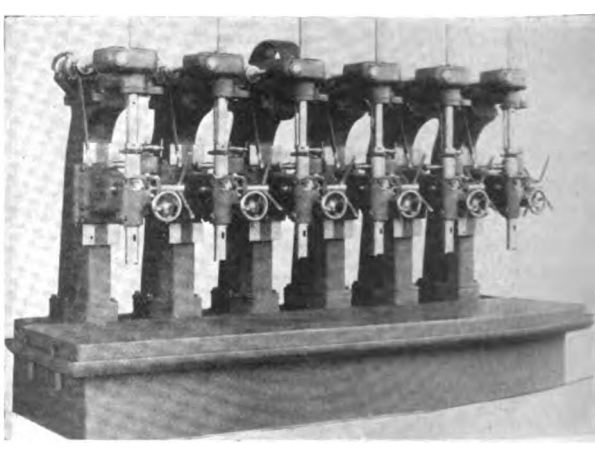


Fig. 10. This drill press was used in the automobile industry in 1919. One year later, the multiple drills shown in Fig. 11 were introduced and by 1927 both types had been replaced by the fixed head multiple drill press shown at the right in Fig. 12.

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Fig. 13. Upper left: The engineering service department in an Ohio machine tool plant. Trained engineers analyze customers' problems and the home plants' methods and designs.
Fig. 14. Lower left: The drafting and designing room devoted to special service.
Fig. 15. Right: The department of the plant itself in which special machines are built.

of the turret lathe. Fig. 8 shows a turret lathe set up for any type of general work which would be placed upon it ten years ago. This same manufacturer today presents the machine shown in Fig. 9. On this machine are incorporated many production features which were omitted on the previous design—all of this in keeping with the trend toward higher production and better machining methods.

This same story holds true with the manufacturer of drills. The type of drill press used for the automobile industry in 1919 is shown in Fig. 10. In 1920 we see the development shown in Fig. 11, and in 1927 completes a fixed head drill press shown in Fig. 12.

The point that we wish to emphasize right here is that machine tool service and the coöperation between machine tool manufacturers and important users of machine tools, has been responsible for this decided increase in design. One type of machine tool after another could be taken to show similar improvements and similar steps ahead.

Engineering Service Likewise Improved

The demand for engineering service in the plant of a large manufacturer of machine tools in Ohio has increased 350 per cent. from 1920 to 1926, and the demand for 1927 as indicated by the first six months of the year, shows the tremendous strides which have been made. The service of this manufacturer started approximately eighteen years ago and it shows a real constant growth. With this demand has grown the personnel of this service, Figs. 13 and 14 show a portion of the interior service department. Capable engineers are employed to give careful analysis both in the manufacturer's plant and at the home office. These men for the most part are graduate engineers and many of them have, through the coöperative course of education in use in Cincinnati, been with the manufacturer for a period of six or seven years, so that he is familiar not only with technical knowledge obtained at the University, but when he graduates is able to assume his duties with a keen appreciation of the manufacturer's problems and his products. This same department maintains its own subdepartment for the laying out of fixtures, special heads and special machines. Fig. 15 shows a department in the plant of this machine tool manufacturer, in which customers' fixtures, special heads and special machines are constructed—one quarter of the department only is shown. It will be seen, then, that this engineering service involves not only the analysis of the customer's requirements and the making of recommendations to overcome his existing difficulties, but it also includes the design, building and demonstration in the customer's plant of the actual machines.

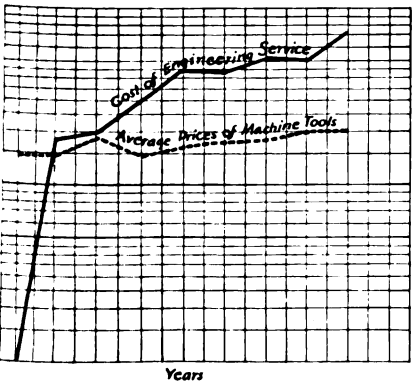


Fig. 16. The heavy curve shows how rapidly the cost of engineering service has grown while the cost of machine tools shown by the dotted curve has varied very little. Note that the curves are plotted on logarithmic paper. On ordinary cross-section paper, the contrast would be still more marked.

Machine Tool Builders Attitude Toward Service

Machine tool builders are eager to coöperate with users of their product and to render service which can be mutually satisfactory. They are somewhat concerned, however, over the discrepancy between the cost of this service and the remuneration received for it, through the purchase of their product. Fig. 16 shows two very interesting curves plotted on logarithmic paper to show parallel or lack of parallel growth. It will be noted at

(Continued on page 40)

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The MECHANISM of BUYING

A System of Forms for the Purchasing Agent

This is the first article of a series by Mr. Alexander. It establishes the frame-work of the purchasing system in a simple, successful manner. In his next article, he will discuss the purchase control of stores.

By S. Craig Alexander

THE purchasing department performs a specific function in the business organization. It centralizes and controls the purchase of materials and services. The principal reasons for its development are (a) to more efficiently satisfy the needs of the organization for materials and services, and (b) to better control commitments for obligations requiring the expenditure of the company's funds. The proper functioning of the department requires organization and a definite mode of procedure. The best system of purchasing is that which will perform the most work to the best advantage in the simplest manner with the least labor in the shortest time.

It is not possible to detail a system of purchasing applicable without change to every class of business. The kinds of organization and the methods of purchasing vary too greatly. A purchasing system, for instance, applicable to a small company buying material frequently in small quantities locally, as needed, and separately for each job, would not well fit a large company purchasing a comparatively few articles in large quantities on a contract basis from a relatively small number of suppliers.

There are, however, certain principles and certain modes of procedure more or less common to the different types of organization and the different methods of purchasing. With a knowledge of these, and of the specific work, it is merely a matter of detail to make the application and develop the system of purchasing best suited to the specific conditions.

The principal factors to be considered in the development of a system of purchasing are:

(a) Duties, (b) Organization, (c) Personnel, (d) Records, (e) Forms, (f) Layout, (g) Methods, (h) Routine.

In this article, we shall limit our consideration of purchasing to the work of the purchasing department proper. In later articles, we shall consider the purchase control of stores, and the more technical work of the combined research and purchasing department.

We shall outline a tentative system of purchasing which shall embody all that is necessary in fundamentals for the development of a system that will suit almost any condition. One similar replaced a more elaborate but confusing one in the organization of a large continuous process manufacturing company buying some millions of dollars a year with a resultant saving to the department of the

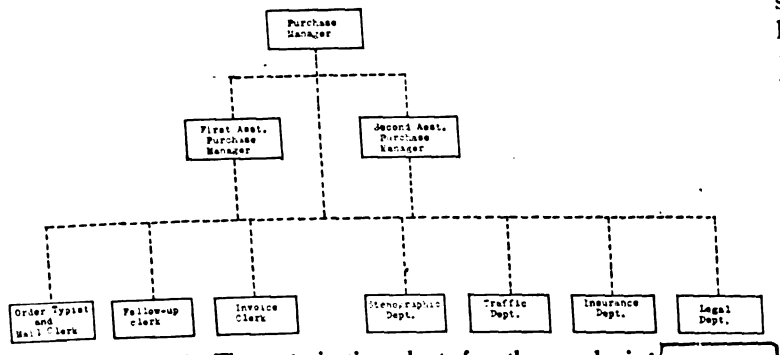
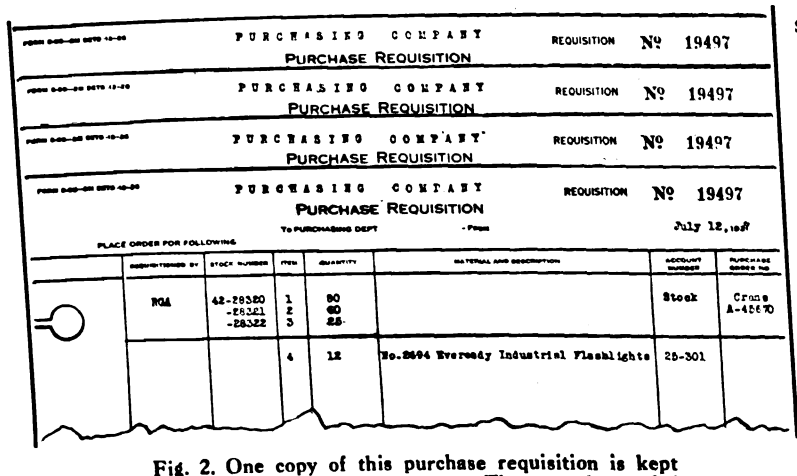


Fig. 1. The organization chart for the purchasing department of a large corporation. By combining the duties of several individuals in the above, the same plan can readily be applied to a smaller staff.


PURCHASING COMPANY — REQUISITION Nº 19497
PURCHASE REQUISITION
PURCHASING COMPANY — REQUISITION Nº 19497
PURCHASE REQUISITION
PURCHASING COMPANY — REQUISITION Nº 19497
PURCHASE REQUISITION
PURCHASING COMPANY — REQUISITION Nº 19497
PURCHASE REQUISITION
To PURCHASING DEPT — From — July 12, 19xx
PLACE ORDER FOR FOLLOWING

	REQUISITIONED BY	STOCK NUMBER	ITEM	QUANTITY	MATERIAL AND DESCRIPTION	ACCOUNT NUMBER	PURCHASE ORDER No.
	RGA	42-28320 -28321 -28322	1 2 3	80 60 25		Stock	Cross A-45670
			4	12	No.2694 Eveready Industrial Flashlights	25-301	

Fig. 2. One copy of this purchase requisition is kept by the requisitioning department. Three are forwarded to stores which keeps one and forwards the other two to the Purchasing Department.

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time of two people and half the time of a third.

Duties

The duties of the department will begin with the receipt of the requisition. We shall assume four sources of origin of the plant requisition, Engineering, Construction, Laboratory and Stores. Requisitions from the first three will clear through the third. Emergency orders may be placed by any of the first three direct with the purchasing department by telephone or telegraph and later confirmed through the Stores. The purchasing manager also originates requisitions at times. There is a supplementary requisition for office equipment and supplies. For simplicity, we shall assume there is one large plant. The addition of other plants introduces no special complications.

The duties of the department will consist of: the actual purchase, follow-up, making of contracts, study of markets and sources of supply, and the clerical work incident upon the preparation of orders, maintenance of records, checking and passing of invoices, and necessary notifications to other departments, and reports.

Organization

The department organization consists of: (a) the purchase manager, (b) the first assistant purchase manager, (c) the second assistant purchase manager, (d) the combined mail and record clerk and order-typist, (e) the follow-up clerk, and (f) the invoice clerk. The first assistant acts as chief clerk in addition to buying laboratory equipment and supplies and office equipment and supplies. Requisitions and mail, excepting invoices and bills of lading, which are passed direct to the follow-up clerk, are cleared through this desk. He passes to the purchase manager and second assistant all requisitions and papers covering the classes of materials they buy. He works closely with the purchase manager, supplements his work, and takes his place when he is away. The purchase manager attends chiefly to the larger engineering and construction purchases, making of contracts, placing of large orders, contact with the management and the plant departments, study of markets, and interviewing salesmen and determining whether or not to put them in contact with the technical departments of the plant. The second assistant purchases such engineering and construction materials and stores as are not handled by the purchase manager, interviews salesmen, and studies markets. It is especially his duty to keep posted on the fluctuation of prices.

The combined mail and record clerk and order-typist opens and distributes mail and requisitions, types and records all orders, charge-backs, etc., and looks after the filing of the requisitions. The follow-up clerk follows orders for shipment, and then bills of lading and invoices, clears invoices by attaching to order, arranging alphabetically for convenience and passing to invoice clerk, passes shipping papers and notices to proper de-

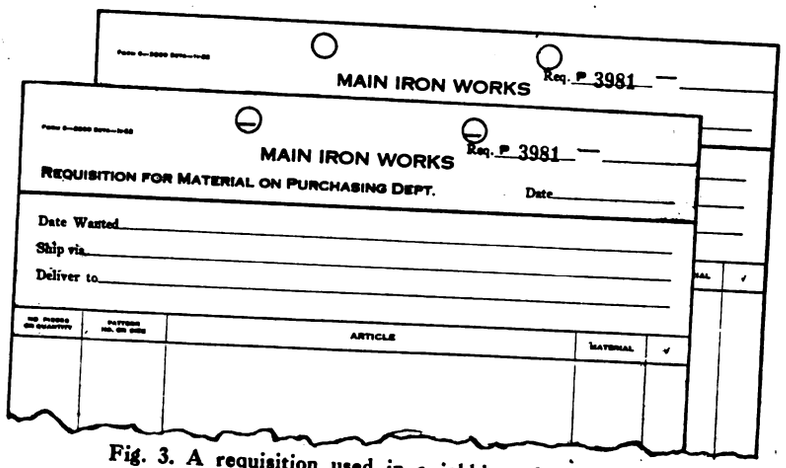


Fig. 3. A requisition used in a jobbing plant. It is simpler than that shown in Fig. 2.

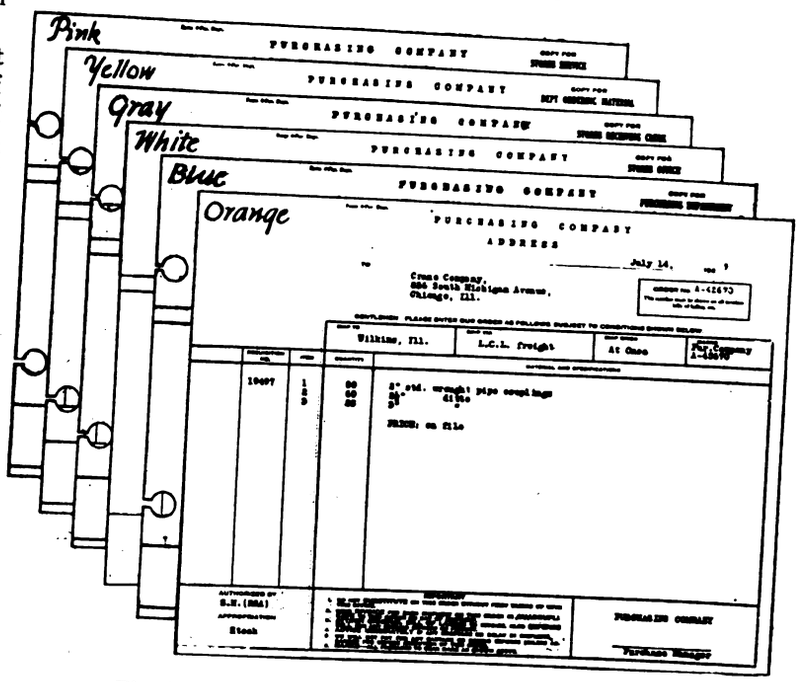


Fig. 4. This is the plant material order. The original is mailed to the firm which is to supply the goods and the other copies go to the home departments indicated in the upper right hand corner of each.

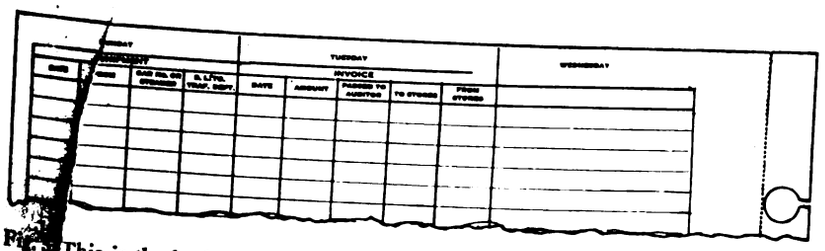


Fig. 5. This is the back of the purchase order shown in Fig. 4.

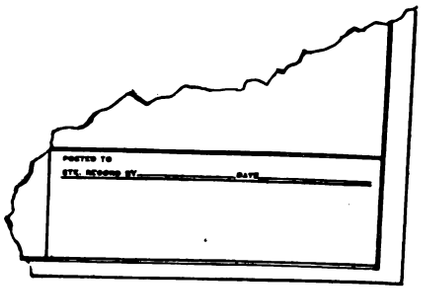


Fig. 6. A corner of the store's copy of the purchase order which insures posting to the stock records.

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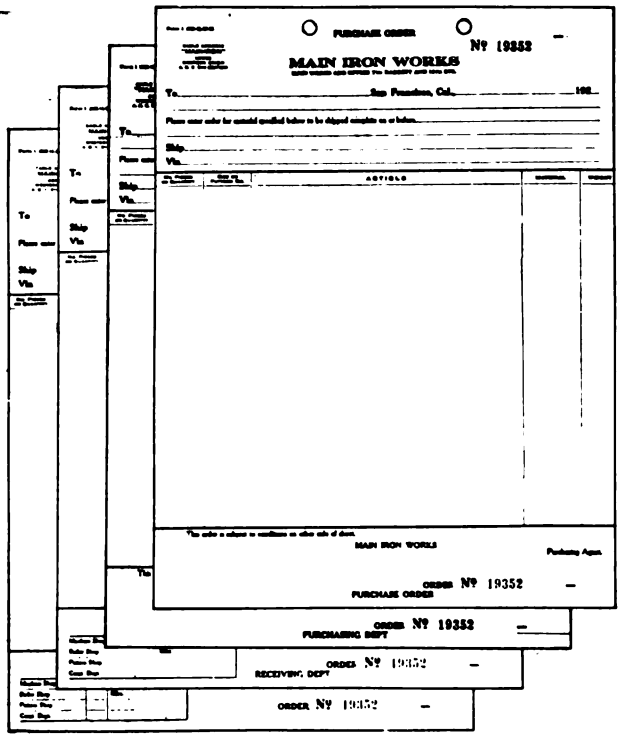


Fig. 7. This is a simpler form of purchase order used in connection with the requisition shown in Fig. 3.

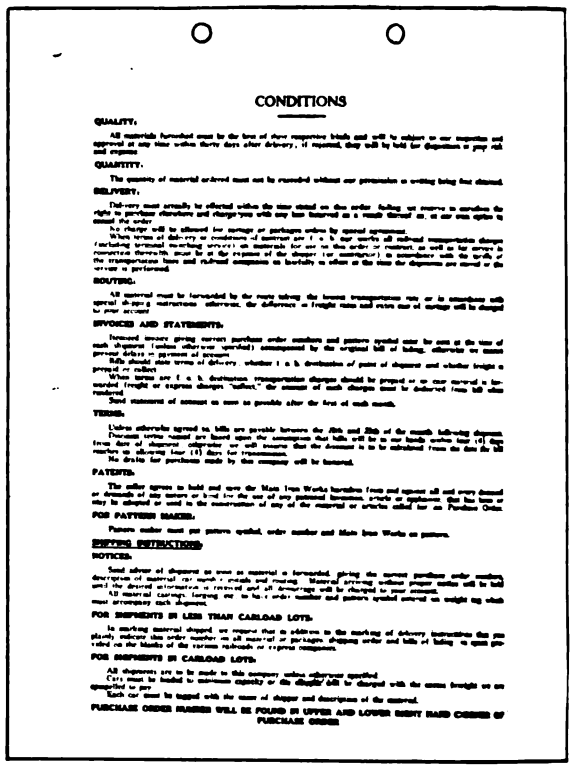


Fig. 8. The back of the purchase order shown in Fig. 7.

partments, and looks after delivery of rejected and returned goods. The invoice clerk records the details of the invoices on the back of the order, checks prices, extensions, terms, and discounts, passes copies to the accounting and stores departments, follows up return of approved invoices from stores to insure receipt of material, looks after making of charge-backs on returned materials, and keeps track of society memberships and subscriptions to periodicals.

The centralized stenographic department is used for dictation, the general file clerk for filing, the traffic department for traffic work, the insurance department for insurance coverage, and the legal department for passing upon protection and legality of contracts.

The plan of organization of the purchasing department, and its relation to its supporting departments, is shown in Fig. 1.

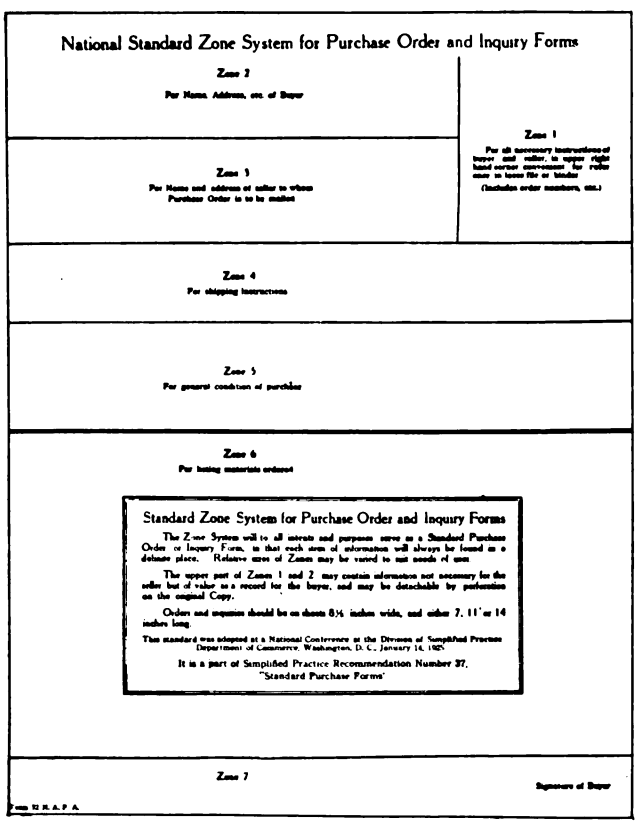


Fig. 9. The use of the zone system for purchase orders has been standardized by the National Association of Purchasing Agents. Its purpose is to place each item of information on a definite part of the order form.

Personnel

Without the interest and coöperation of the personnel, any system of organization is handicapped from the start. The efficient functioning of the department will depend considerably upon the type of personnel and the interest they take in their work. Assuming a pride and eagerness in their work, prompt placing of orders, and efficient, anticipated follow-ups, the department should function efficiently and smoothly, and have the complete support of the requisitioning departments.

Records

For efficient departmental control, it is essential the departmental records be complete enough to provide all information necessary for reference and control, but at the same time simple and accessible. They must be planned with these thoughts in mind. Following are the more important records and suggested form.

1. Unplaced Requisitions—numerically in post binder.
2. Placed Requisitions—to file in post binder.
3. Order Register—17" x 7¼" bound books.
4. Unfilled Orders—alphabetically by suppliers, loose leaf

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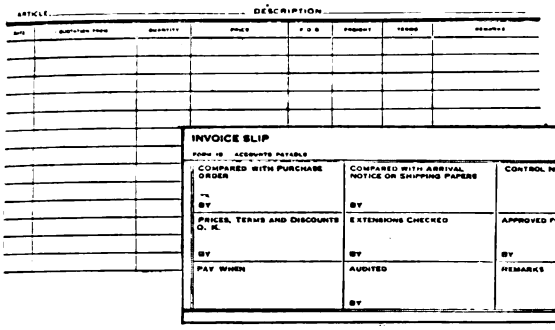


Fig. 10. A price record card for the purchase manager's file.

Fig. 11. A gummed sticker like this may be attached to the bottom of an invoice for checking and controlling purposes.

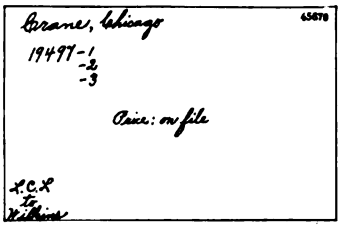


Fig. 12. A short cut way of placing orders. The requisition comes to the purchasing agent's desk. If he wants to place the order, he fills out a numbered sheet as above and attaches it to a requisition. The order typist then fills out the order.

5. Filled Orders pending Invoice Approval—same as above.
6. Completed Orders—vertical file, numerically.
7. Invoices—vertical file, alphabetically by suppliers.
8. Purchase Record—(In Stores section as visible two-card perpetual inventory control in cabinets. Will be discussed under Purchase Control of Stores. For control of Stores of several plants, Master Card should be duplicated in purchasing department.)
9. Contracts—(a) vertical file alphabetically by supplier, (b) card index by commodity.
10. Budget and Appropriations—loose leaf.
11. Price Record—(a) card file or loose leaf visible by commodities, (b) originals in loose leaf binder by supplier.
12. Terms and Discounts Record—small ring binder.
13. Quotations and Estimates—(a) vertical file by number, (b) cross index, card or loose leaf visible, by article and supplier.
14. Claim Register—loose leaf.
15. Subscriptions and Memberships—small ring binder.
16. Plant Standards—loose leaf visible.
17. Stores Specifications—loose leaf, or loose leaf visible.
18. Schedule of Accounts—small ring binder.
19. General Correspondence—vertical file.
20. Office Forms—scrap book, loose leaf.
21. Economic Service Reports—loose leaf.
22. Graphic Charts of Market Movements—loose leaf.
23. Catalogs—(a) vertical file by commodity groups, (b) large volumes in bookcase, (c) cross index by commodity and supplier, control numerical, card or loose leaf visible.
24. Manual of Purchasing Department Procedure—loose leaf.

There may be some special records and reports peculiar to the particular business, but the above lists the records most generally applicable. If the list seems formidable, remember the simplicity lies in the segregation.

Forms

Proper forms assist in perfecting the routine and speeding up the work. They may be loose or padded sheets, cards, or leaves depending upon convenience.

The purchasing process is started by the requisition. A form of plant requisition is shown in Fig. 2. It is made in quadruplicate, one copy kept by the requisitioning department, and three forwarded to the Stores, which keeps one, and forwards the remaining two to the purchasing department. We shall say something later about these two. The local office form of requisition is simpler,

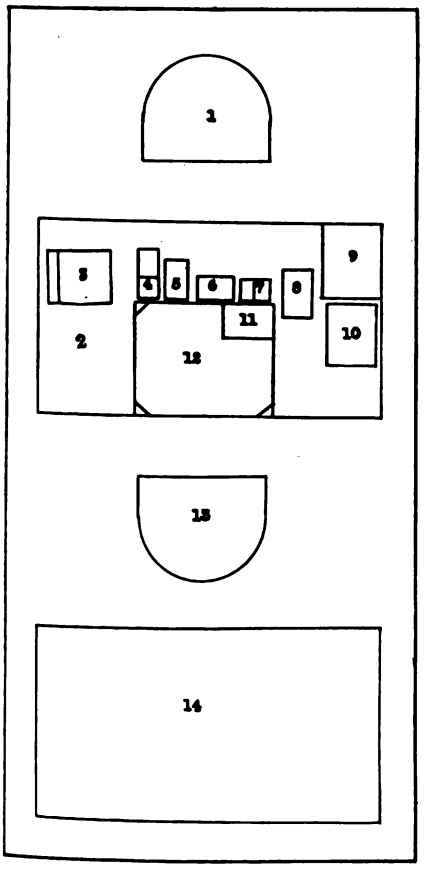


Fig. 13. An efficient arrangement for a buyer's desk developed through long experience. (Left.)

Fig. 14. A page of the store's specification book. (Right.)

Specifications - Stores Items.
Pipe Fittings - Black - Group 42

Description	Size	Unit	Stock Number
Couplings - std. black wrought pipe	1/4"	Ea.	28313
	3/8		28314
	1/2		28315
	3/4		28316
	1		28317
	1 1/4		28318
	1 1/2		28319
	2		28320
	2 1/2		28321
	3		28322
	3 1/2		28323
	4		28324
	4 1/2		28325
	5		28326
	6		28327
	8		28329
	10		28330
	12		28331
Ells - std. black malleable	1/8"	Ea.	29000
	1/4		29001
	3/8		29002
	1/2		29003
	3/4		29004
	1		29005
	1 1/4		29006
	1 1/2		29007
	2		29008
	2 1/2		29009
	3		29010
	4		29011
	5		29012

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embodies no special features, so will not be shown. For convenience, a third form of requisition is sometimes used for the requisitioning by office departments of their week's office supplies. Fig. 3 shows a form of requisition used by a job manufacturing company for comparison with the requisition of Fig. 2. The space following the order number is for the job number. Each job is given a job number, which follows it through the plant, and is the identification for all materials, etc., for that job.

Fig. 4 shows the plant material order. Each of the six sheets is a different color, and in addition is marked with the department intended for in the upper right hand corner. Fig. 5 shows the back of the purchasing department copy. The days in the upper and lower margins are used in follow-up with signals on which the day of the month is written for automatically calling to attention on the predetermined date. Fig. 6 shows the provision made on the stores office copy to insure posting to the stock record. For comparison, there is shown in Fig. 7 the purchase order used with the requisition of Fig. 3. Fig. 8 shows the back of the supplier's copy of this order.

The National Standard Zone System for Purchase Order Forms is given in Fig. 9. This is the standard of the National Association of Purchasing Agents. The system is also standard for Inquiry Forms. Inquiry Forms should have plainly printed across their face, "THIS IS NOT AN ORDER," to prevent any possibility of supplier mistaking for an order.

The order form used for office supplies, executives' personal orders, etc., is much simpler than the plant material order. A simple form with one carbon copy is usually sufficient.

Fig. 10 shows a price record card, and Fig. 11, a gummed sticker for attaching to the bottom of invoices, for checking and control.

Other forms are: tabulation of bids; catalog index cards; follow-up; rejection of bids; interdepartmental information forms; etc.

Much can be done in the layout of a department to facilitate work. Location of desks, both with respect to visitors from outside and to each other, accessibility of files with respect to the individual who most uses them, and other points in connection with the office layout can be studied to advantage toward speeding up the work.

Methods

Efficiency of methods is essential if we would receive the full benefit of the systematization of organization, records, forms, and layout. The purpose of the segregation of records given under that division is to so segregate each operation and its record we can locate any information concerning it with the least hesitation and delay. The same idea can be applied to the systematization of desk work.

It interferes seriously with efficient work to have to hunt through piles of papers on a desk for a particular paper. Also, there is a constantly recurring tendency for the attention to wander from the work in hand to the piles of papers, from which we have a series of alternate attentions and distractions which does not conduce to the most efficient work. There is no need for a cluttered-up desk. The proper arrangement and use of baskets, loose sheet holders, work organizers, and indexed drawer files will correct this. Fig. 12 shows the desk arrangement of a buyer where there is at all times a minimum of papers in sight. The sheet holder for requisitions, three-high basket clipped to desk, and work organizers and indexed files in the drawers take care of all papers irrelevant to the work in hand. Frequently the proper systematization of a desk will so expedite work that has dragged and irritated, it can easily be doubled.

Fig. 13 is the basis for a unique method of placing orders. Pads of numbered blank sheets are provided the buyer. Requisitions come to the department in duplicate. The original is kept by the order-typist, and a copy goes to the buyer who will place the order. Requisitions and items are numbered. To place an order, it is only necessary for the buyer to write the supplier's name, requisition and item number, price, and shipping instruction on one of the numbered sheets, and slip into the three-high basket outgoing order section. The order-typist writes the order from the original requisition.

Fig. 14 shows a page of the Stores Specifications. Articles are grouped under an inclusive group number, and each item carries its individual number. To order an item, the originator of the requisition need only write on the requisition the group number and the individual item number. Copies of the Stores Specifications are on file in the Stores section, with the order-typist, and with each buyer. This system is practical where a number of items in a group are ordered at one time. The specifying could be so scattered over the specification book as to become burdensome to the buyer.

These are a few of the methods that may be used to expedite purchasing work. Others should suggest themselves upon study of the specific conditions.

Routine

Routine is the established day to day method of doing things. It covers routes followed by the forms in their travel, the succession of operations of each desk, etc. Its essential features are best embodied in the Manual of Procedure. The Manual of Procedure then serves as the text of approved practice. Its usual form begins with an exposition on the purpose and use of the manual, and then takes up organization, office rules, department standards, general procedure, preparation and use of forms, and graphic charts showing lines of authority and responsibility, route of travel of forms and their distribution, etc. As the basis of established practice, it forms also the basis for further development and improvement of the purchasing system.

Electrical and Industrial Exposition Opens

MORE than twenty-five thousand electrical devices and appliances, representing the best in man's new servant that is taking over the drudgery of the earth, are being displayed on the three floors of the Grand Central Palace when the 20th Annual Electrical and Industrial Exposition opened its doors, Wednesdy, October 12th.

There will be shown the latest and finest in refrigerators, trucks, vacuum cleaners, sewing machines, kitchen appliances, beauty shops, electro-therapeutics, military equipment, and devices for heating the home and plant.

Seventeen manufacturers of electrical equipment will participate and will have booths. The exhibit will be in charge of a committee representing the electric light and power companies of New York and vicinity.

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Where

UNIT TYP

Solve Both Heat a

By Tyler Stewart Rogers

THE most important advance in heating systems for industrial plants and warehouses that has been made in many years has been the recent introduction of unit heaters. They have proven to be more efficient in their heating capacity than old style types of direct radiation and their initial cost, including the cost of installation, is showing marked economies over older methods.

The principle of all unit heaters is the combination of a motor driven fan or blower to force air through heater coils (or in some types to draw the air through the coils) and thence to disseminate it into the space to be heated in such a way as to set up a forced circulation of the warm air. The elements of all unit heaters, therefore, consist of a casing which more or less completely encloses some form of radiator, a fan or blower, and a motor.

In order to make an intelligent selection of unit heaters for any given purpose it is first desirable to distinguish between the various types of heaters that have been developed. All types function and each has its place in the solution of some spe[illegible]m, but none of them has advantages which place it in a position of being universally adaptable to all conditions. The first classification of heaters is between: (1) those emitting their warmed air at high velocity, that is, at a rate of 1,500 feet per minute or better and (2) those of relatively low discharge velocity ranging from 600 to 1,500 feet per minute. A subdivision of each of these classes could be made between: (a) those which recirculate the air by means of intake ducts extending down to or nearly to the floor so that they establish a complete cir-



Fig. 2. A close-up view of a non-recirculating suspended unit heater of the draw-through type, showing the casing with an adjustable deflector used mostly in the summer when the fan is operated without steam in the heating coils.

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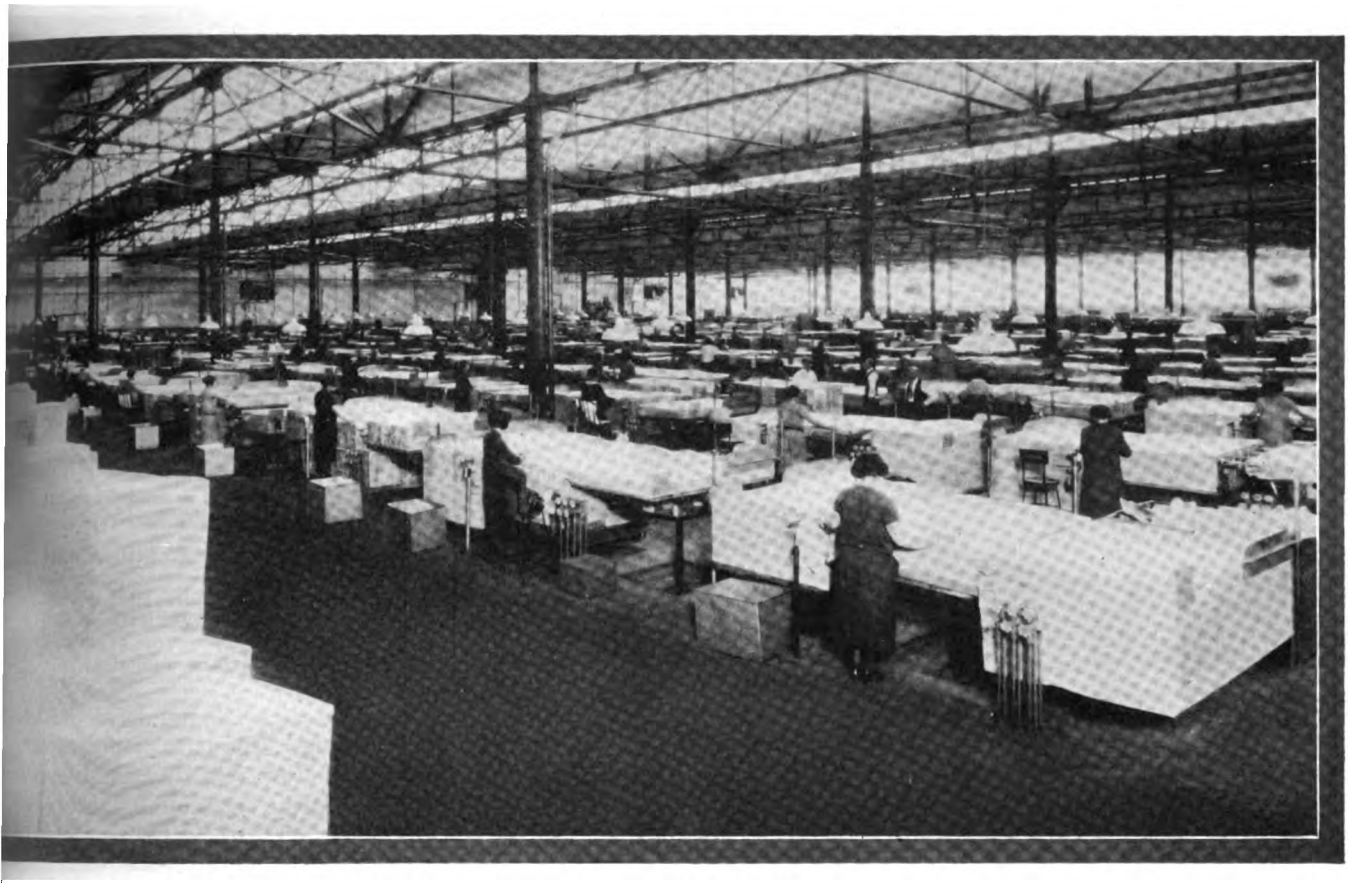


Fig. 1. Large single story structure, ceiling height 20′ to saw tooth, glass 13′ high in saw tooth. Several hundred girls are employed in this building and a uniform temperature is maintained throughout the entire area. Actual tests show less than a 15° temperature variation between floor and ceiling, with non-recirculating, suspended heating units.

HEATERS

entilation Problems

culatory motion of the air to and from the heater; and (b) the non-recirculating types, or those which have no floor intake and simply draw in the air at the plane at which the heater is located. Among the non-recirculating types there may be a further distinction between (c) those which send their discharge in a more or less horizontal plane and (d) those which are suspended overhead discharging their air downwards or in a diagonal direction towards the floor.

The first problem is to determine which of these types is best suited for the conditions at hand. In general a difference between high velocity and low velocity heaters is in the number of units required for a given volume of space. The high velocity type discharges its air in a horizontal plane over the heads of the workers with sufficient velocity to be effective over a distance of from 200 to 300 feet away from the outlet. The air moving at the speed necessary to cover this distance necessarily picks up and moves with it a great deal of the surrounding air so that the total air put into movement by the high velocity heater is several times the volume actually passing through the fan or blower. In comparing high velocity heaters with low velocity heaters for this reason the rated capacity in cubic feet per minute of the high velocity heater may appear to be very much less than that of the low discharge velocity type and yet actually be more effective in the total amount of air moved. Furthermore, the high velocity discharge type, by picking up this extra volume of air in the room, causes it to absorb the heat from the warm current and actually has a tendency to check the rise of the warmed air to the ceiling with the result that a greater uniformity of temperature throughout the room is obtained than with the lower



Fig. 3. This ceiling type heater employs an open centrifugal fan spreading the air in all directions. The shield is designed to send the air downwards toward the working plane.

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Fig. 4. Ranging the heaters along the walls, all operating in the same direction around the room, is often effective.

Fig. 5. Left: The high velocity discharge heater shown in the foreground re-circulates the air. The discharge carries from 200 to 300 feet, hence the number of units is a minimum.

velocity types. When combined with the recirculating feature there is even a more marked tendency for the warm air to remain in horizontal strata and spread downwards, so that it is not uncommon to get a difference in temperature of less than one-half to one degree per foot of rise from the floor to the ceiling. This means in practice that the high velocity discharge heaters with the recirculating feature tend to give a very high degree of uniformity of heating throughout the area which they serve.

This characteristic of the high velocity discharge type to keep the warmed air in horizontal strata having a downward tendency also makes them especially effective in rooms with very high ceilings as in monitor roof buildings where normally the warmed air first collects to form a pocket under the roof before the working plane is warmed up to a comfortable temperature.

The low velocity discharge types have an effective range up to 100 and occasionally 150 and if used in sufficient numbers produce practically the same results as the high velocity type, but of course do not have the advantage of economy of piping. The lack of pressure to the discharge means that the low velocity type does not pick up and move as much of the surrounding air; hence the discharge stream does not lose its temperature so quickly and tends to rise to the ceiling before heating up the lower strata.

The choice between the recirculating and non-recirculating types is generally in favor of the recirculating units having floor intakes as this feature tends to keep the warm strata moving downwards towards the floor and thus equalizes the distribution of heat in the lower planes, where it is of most importance. In actual practice the recirculating types do not pick up and redistribute floor dust in spite of the contrary claims of manufacturers who do not offer this feature and the only real objection that can be raised to the recirculating type is the fact that it may occupy a small amount of floor space whereas the suspended types do not obstruct the working plane in any way.

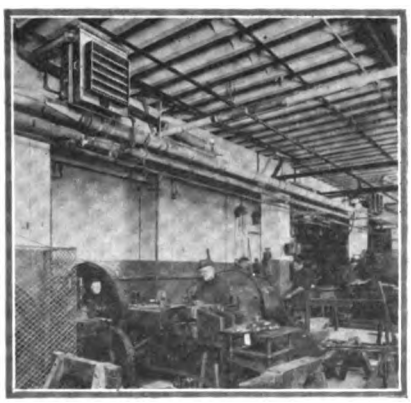


Fig. 6. Unit heaters installed in an old building by tapping steam mains. Similar units can correct cold spots where direct radiation fails.

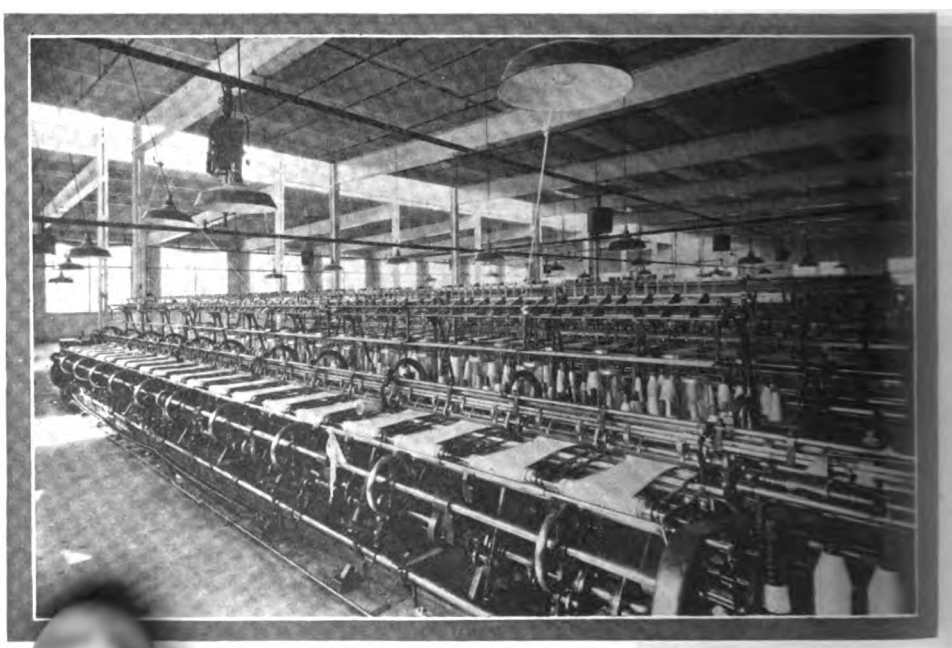


Fig. 7. Right: A large installation of very light weight units suspended directly from the steam main without other support. These units are directed from the center of the room toward the windows.

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Fig. 8. A pair of light weight units placed over garage entrance doors to prevent cold blasts chilling the interior.

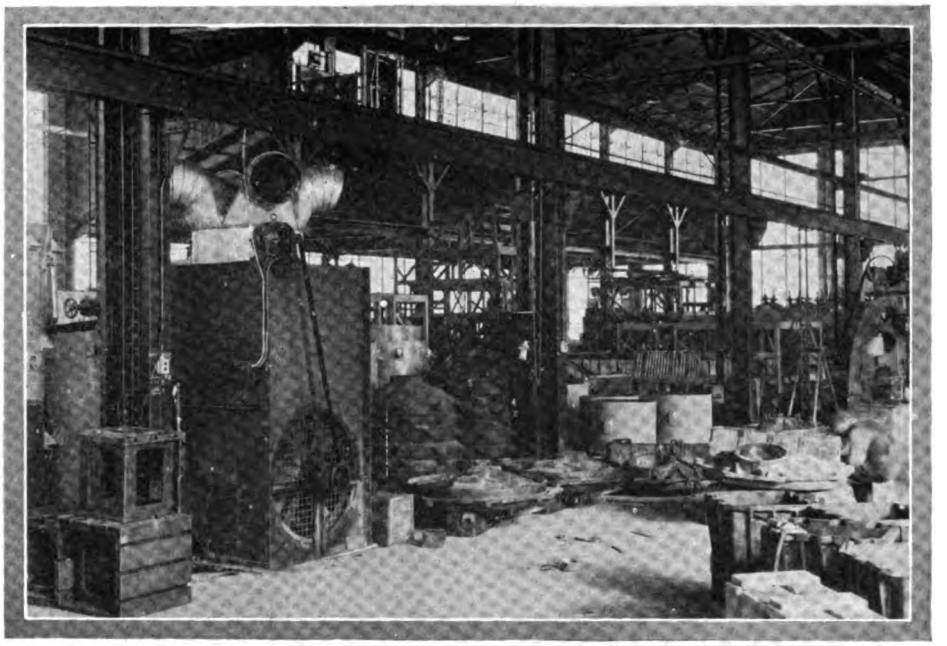


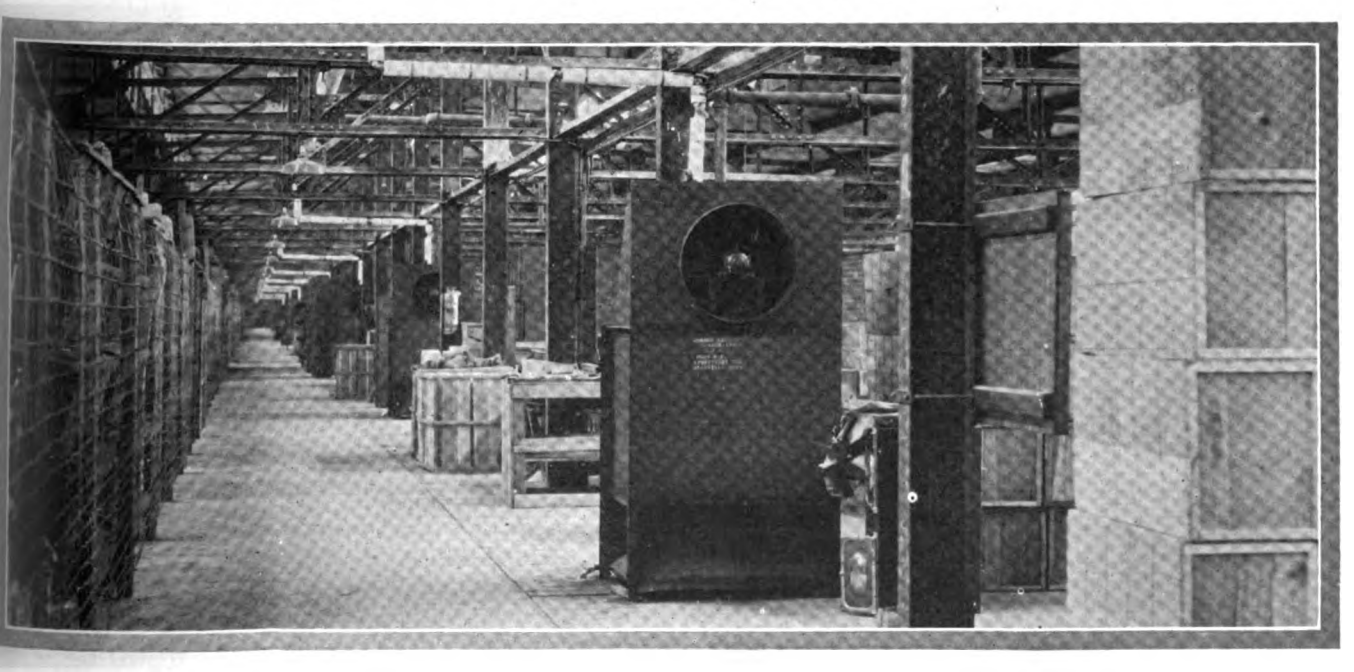
Fig. 9. Right: Floor stand type heater with four-way discharge about eight feet above the floor. The air is taken from near the floor and discharged through pipe coils.

The choice between the non-recirculating units discharging their air in a horizontal plane and those mounted close to the ceiling discharging their air downwards depends upon the conditions to be met. It is a known fact that air stratifies in layers with the coolest air at the floor and the warmest air at the ceiling and that these layers offer a relatively high resistance to a vertical disturbance. It takes more power to drive a blast of air downward through the various strata than it does to move an equivalent amount of air horizontally in any given plane. For this reason the overhead types are working against somewhat of a handicap which the manufacturers claim is offset by the fact that they are taking the warm air near the ceiling and recirculating it toward the floor whereas the horizontal types are simply moving the air midway between the floor and ceiling. The overhead type, of course, might be objectionable if the draft was downward on the heads of workers standing in one position but probably would not be at all objectionable in places where the workers were moving about from place to place as would be found in a foundry or railroad shop.

In the selection of heaters the installation cost is of great importance, for the greatest difference between the use of unit heaters or of direct radiation lies in the fact that unit heaters require but very little piping; with correspondingly few valves and joints resulting in a system with less tendency to leaks and requiring less attention to repacking valves. A large number of small sized unit heaters may sometimes be employed to good effect when a steam main must be extended along the line where the heaters are to be located but otherwise there is generally a marked advantage in using the largest size heater that can be installed for a given area so as to reduce the piping to a minimum. This is an advantage of the high-discharge velocity, recirculating type.

(*Continued on page* 42)

Fig. 10. An unusual installation where the fans are driven by small steam turbines in each unit, and the discharge is along the floor.



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How does monitor design affect natural ventilation?

Now you can eliminate much of the guesswork in determining the natural ventilation of your new buildings — while your building plans are in process. A method developed for and used by the Department of Engineering Research of this company makes it possible to predetermine with considerable accuracy the answers to such important questions as the following:

1. How does a monitor contribute to the natural ventilation of a building?

2. How does the orientation of the monitor with reference to the prevailing winds affect the ventilation?

3. How do monitor width and height affect ventilation?

4. Does the slope of the monitor roof influence the ventilation?

5. How does the degree of opening of the monitor windows vary the air circulation?

6. Does the type of window used affect the ventilation? In other words, is there any advantage in using top-hung windows, rather than center-pivoted, or vice versa?

7. What conditions determine whether windows should be opened on both sides of the monitor or on only one side, and how is the one side determined?

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What can you tell me about securing the most satisfactory natural ventilation in the building described below?

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Multi-story.....To be used for the following purposes....

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Length.....Width.....Height.....

Note: If possible, send tentative plans, elevations, sections or sketches showing size and location of all proposed windows with sill heights, together with any additional information which would have a bearing upon the design of the structure to be erected.

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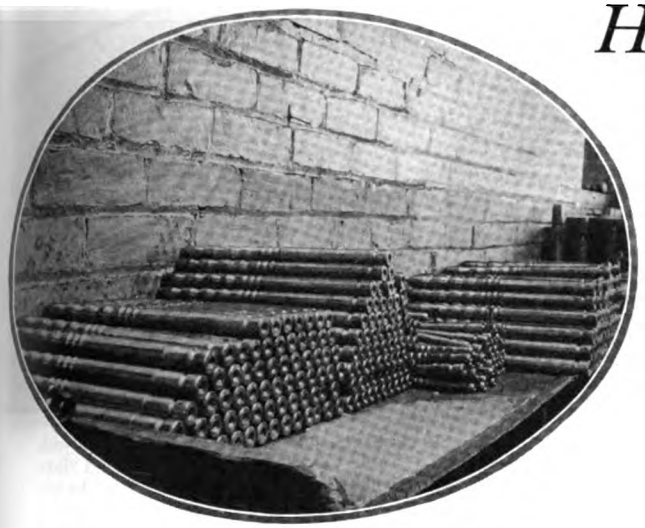


Fig. 1. Broaching tools used for burnishing bronze bearings on a quantity production basis.

How the Motor Car Has Affected the Design of PLAIN BEARINGS

A discussion of the various types of plain bearings suitable for use in modern high speed machines, with the economic value of each.

By G. A. Ungar

WHILE not so pronounced as with anti-friction bearings, plain bearing practices have been affected to a considerable extent by automotive developments. The influence of the automobile has been chiefly in the direction of employing quantity production methods and standardization of bearing sizes. The development of steam turbines and electrical machinery has on the other hand greatly contributed to the development of plain bearing designs suitable for heavy loads and high speeds. These bearings differ widely from the old types of the days of slow moving shafts.

The modern machine designer is in a position to select his bearings from a considerable number of types. By properly analyzing operating conditions and the functions of the bearing, he will be able to make a satisfactory choice.

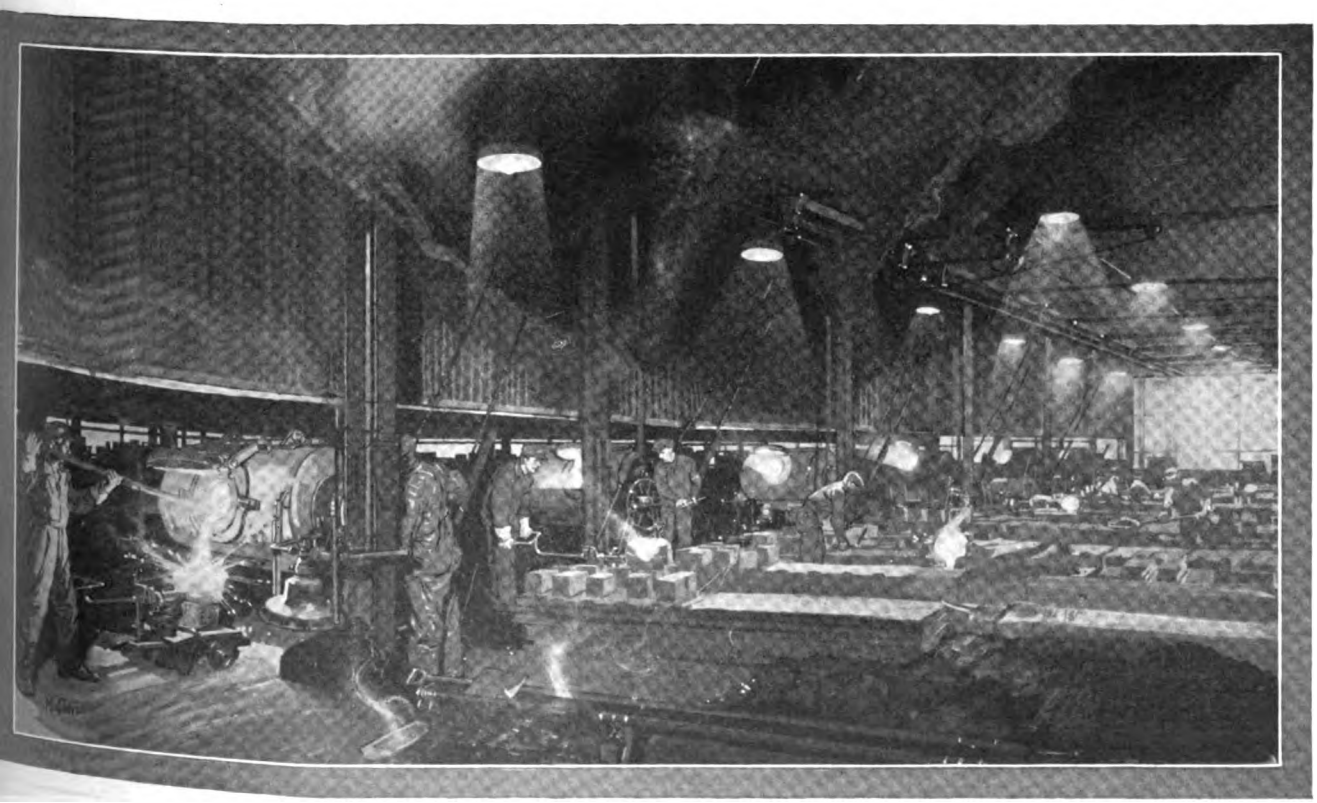


Fig. 2. Pouring of bronze bearings in an up-to-date foundry.

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Two principal types are available in plain bearing practice.

(A) Oilless bearings or initially lubricated bearings.

(B) Lubricated bearings. The latter are again divided into:

(a) Periodically lubricated bearings, using either grease or oil.

(b) Continually lubricated bearings.

Theoretically, bearings of the oilless type would be ideal if it were not for the limitations which are imposed on them by their inability to operate at more than moderate speeds and under heavy loads. They are also subject to comparatively rapid wear.

Oilless bearings are not lubricated in service but they rely upon the action of a lubricant incorporated with the bearing either in liquid or solid form.

The largest number of oilless bearings utilize graphite in one form or another. Both natural (flake) or artificial (amorphous) graphite are used. There are three principal methods of using graphite in oilless bearings.

(a) The graphite is mechanically inserted into the bearing surface.

(b) Finely powdered metal (bronze or babbitt) is mixed with graphite and held together by a binder.

(c) Graphite held together by suitable binders is pressed into the required shape.

Bearings of the plain lubricated type utilize the film of lubricant, which under certain conditions forms between the metallic surfaces of the journal and the bearing, thereby preventing rubbing of these surfaces and consequent friction and heat.

The formation of the lubricant film and the frictional resistance of the bearing depend upon the bearing load, the shaft speed, the character of the lubricant (whether it flows readily or not), the smoothness of the bearing and shaft surfaces and the bearing temperature. When at rest, the lubricant film is squeezed out and the frictional resistance when starting is therefore high with plain bearings.

The field of applications can be generally sub-divided into two groups:

(A) Periodically lubricated bearings.

(B) Continually lubricated bearings.

To this group of periodically lubricated bearings belong those lubricated with oil (through oil holes or pressure fittings).

The majority of plain bearing applications in general machine practice belong to this group in spite of its drawbacks in many directions. Their principal advantage, however, is mechanical simplicity and therefore low first cost. The advent of the pressure fitting, a development due to the automotive industry, has eliminated some of its drawbacks.

An analysis of this type of bearing as to its field of usefulness shows the following: load carrying capacity is high. It can be saf for medium speeds.

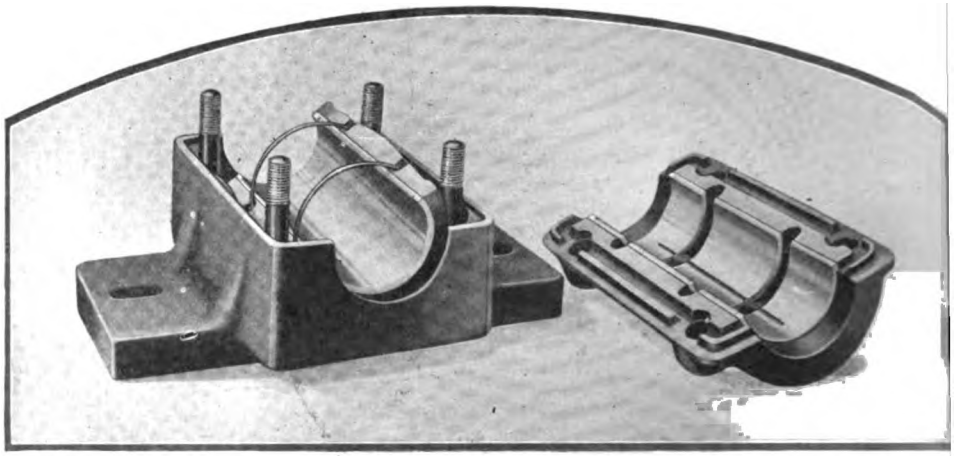


Fig. 3. Above: Ring oiling pillow block with top part of bearing removed. Two oil rings are employed which carry the oil to the top of the revolving shaft. Only one distributing oil groove is provided. This type of bearing is suitable for supporting heavy loads.

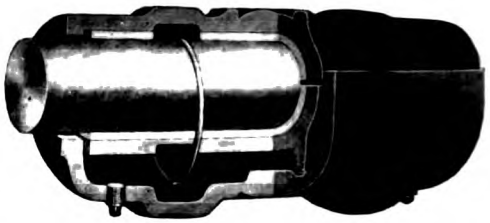


Fig. 4. Represents a ring oiling bearing used for line shaft hangers. Part of the bearing is shown in section revealing one of the oil rings and the oil reservoir from which the rings carry the lubricant to the shaft. The bearing is provided with spherical seats to take care of shaft misalignment.

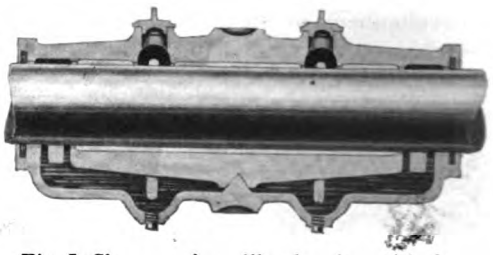


Fig. 5. Shows a ring oiling bearing with dust proof ends. This bearing is provided with two oil rings to supply the oil and with wipers at each end to remove the oil from the journal and to return it to the reservoir. Dust and grit are excluded through the medium of packing rings arranged in suitable recesses of the bearing housing. Felt or light fiber can be used as a packing.



Fig. 6. Represents a view of a pillow block with dust proof attachment. The packing is attached to the ends of the bearing by means of steel packing glands.

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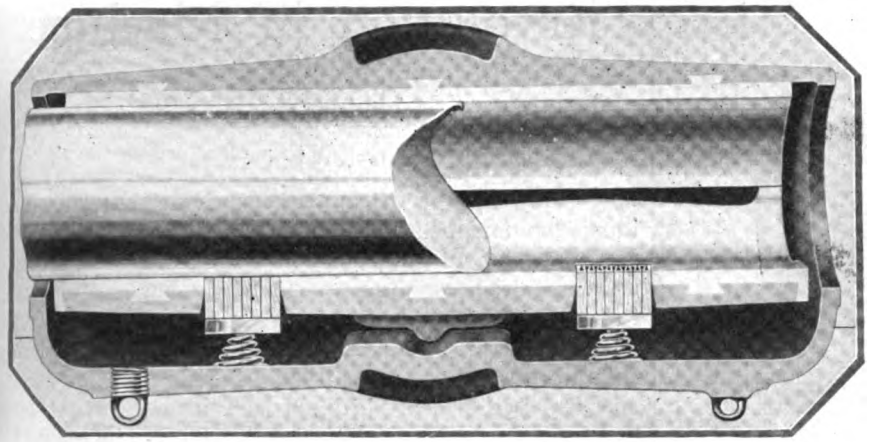


Fig. 7. A sectional view of a capillary oiling bearing. Bearings of this type employ for lubrication the law of capillary attraction by means of which the oil is lifted from a lower to a higher level when confined between narrow orifices or passages. The capillary passages are contained in soft wooden blocks, provided with alternate saw cuts, through which only clean oil works upward to the shaft. The blocks are held in contact with the shaft by springs.

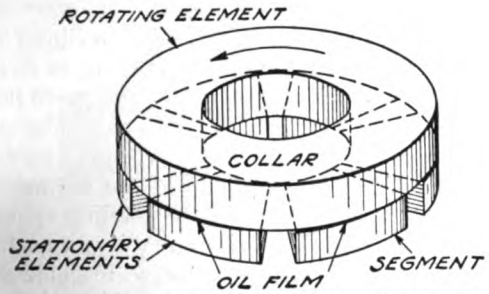


Fig. 8. Shows the principal parts of a thrust bearing. This bearing can operate both in horizontal and vertical position and is used to support heavy thrust loads at speeds ranging from low to very high. The segments, or shoes are free to tilt. The segments remain stationary while the collar rotates. The oil film required for lubrication forms as soon as the bearing begins to turn.

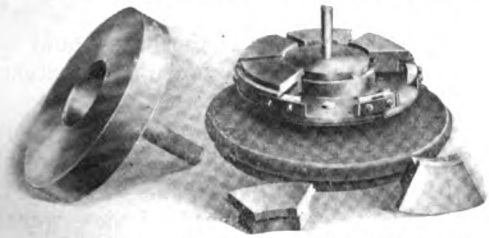


Fig. 9. Thrust bearing model in which air is the only lubricant, demonstrating the complete separation of the bearing faces during operation.

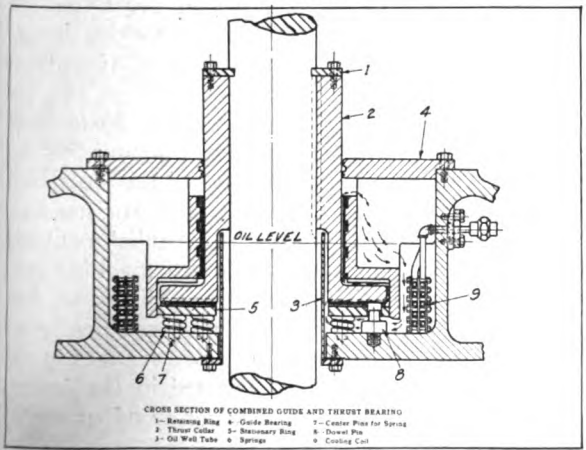


Fig. 10. Shows a cross section of a combined guide and spring thrust bearing. This type bearing is used by the General Electric Company on all their vertical waterwheel driven generators for thrust loads from less than one ton up to larger machines operating continually under thrusts of 275 tons. The arrows indicate the direction of the lubricant as it passes through the thrust and guide bearings.

The frictional losses are high when starting and medium high under running conditions, since the lubricant supply necessary for the formation of the oil wedge is not always assured. The temperature rise in operation is likely to be high between periods of lubrication when operating at high speed. The amount of wear may be considerable, unless lubricant is applied in regular and frequent intervals. First cost is generally low and therefore replacement in case of failure inexpensive.

The materials entering into the construction of this group of bearings are babbitt, bronze and cast iron.

Among the older types are those with waste packing, wick and drop-feed oil cup lubrication, ring and chain oilers representing a somewhat later development.

Waste packed bearings, because of their simplicity, are widely used in railroad practice.

The most highly developed type of bearings in this group are those lubricated with circulating oil under pressure, used in steam turbines, automobile or aircraft engines.

In many installations splash and oil vapor lubrication have been very satisfactory, especially where not only bearings, but also other moving parts have to be lubricated simultaneously.

An analysis of continually lubricated bearings shows the following features: The load carrying capacity is very high. They can be used for very high speeds. The frictional losses at starting are high but at higher speeds they are medium to low. The temperature rise in operation is low at low speeds, medium at medium speeds and medium to high at high speeds. The amount of wear is small to medium. The first cost depends upon the materials employed, the surface finish and design, but is generally medium; therefore the cost of replacement is also relatively low.

Plain bearings of this type are generally made from babbitt, bronze, bronze or steel backed babbitt, steel (soft or hardened). Smooth bearing surfaces are obtained by either reaming, grinding or broaching and they are finished by scraping. For quantity production burnishing with special broaching tools is employed.

Shafts especially for high speed bearings are made of hardened or heat treated steel with ground bearing surfaces.

The principal methods of applying the lubricant to plain bearings depend (a) upon the use of grease or oil as lubricant and (b) upon continuous or intermittent lubrication.

Grease is applied to the rubbing surfaces by means of grease cups, which are either under spring pressure or

(*Continued on page* 54)

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Revolution in Machine Industries

(*Continued from page* 13)

now ready for the machine shop. Now, I submit that this is too obvious a saving, not only of actual operations and material but on an enormous scale of plant and equipment; materials handling and indirect labor and expense, to admit of argument.

It is unnecessary to dwell upon the utility of welding for effecting repairs. Everybody who reads this magazine has seen broken parts put back into service at very little cost, but there is one use of welding which may be considered revolutionary in its way. It was once considered that wear was incurable. If a cylinder became scored through wear, there was nothing to do but rebore it to a larger size. If a shaft became worn there was nothing to do but turn it down to a smaller size. Welding has changed all that. Now you simply build up the worn places with new metal by means of the welding arc. Here is another way in which the building up process may be used: If a six-inch shaft requires a quarter-inch thick collar to be turned on it, the old machine shop practice would have required that the whole shaft be turned down out of a six and one-half inch (or even larger) round. Imagine the waste of that. Now, a six-inch shaft will be used and the collar will be built up by welding.

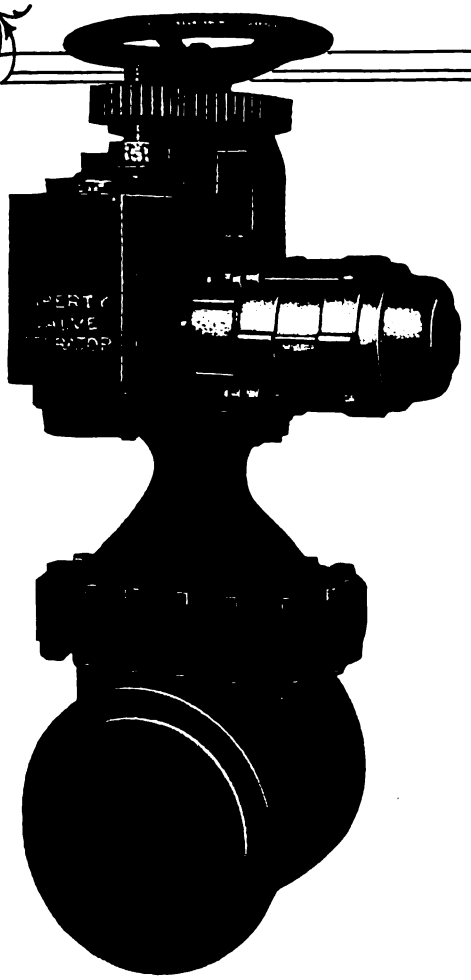
It is not generally known that heterogeneous metals can readily be welded together. For instance, steels of all chemical and physical characteristics, can be welded without change except insofar as the heat would affect them. At present, there are few known combinations of metals which cannot be welded together.

One of the greatest advances in the production of machine parts at reduced expense by the employment of welding, is to be found in the tool-room. Here, the castings for jigs and fixtures, punches and dies, were unusually expensive because only one or two were made from each drawing or pattern. Again, the complicated jig loses its terrors because it is quite possible to bend steel into any form or position, however great the distortion. It can then be held in place by welded braces placed without regard to the requirements of pattern drawing.

I think I have said enough about welding to indicate that I consider the growth in its use for building up machine frames of all types to be one of the outstanding and revolutionary changes through which the machine industry is passing. This, with the establishment of standard methods for the determination of machine performance and a radical change in sales policies so that the leading sales argument will be performance, constitute to my way of thinking, the greatest advances in the machine and tool industry to be expected in the immediate future. They are here now but not all of us see it.

The thirty-first annual convention of the National Founders Association will be held November 16th and 17th at the Hotel Astor, New York City. The addresses and discussions will all be practical and have a direct bearing on the problems which the foundryman is called upon to meet daily in his plant operations.

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Dependability at the Outposts of Industry

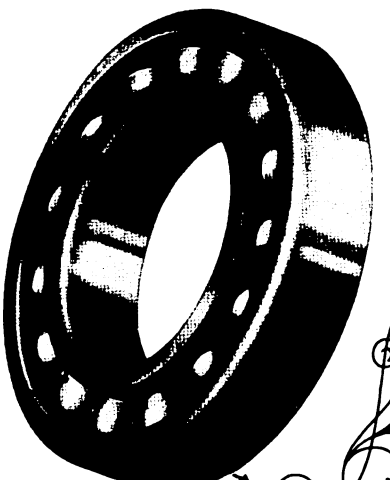
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Absence of radial play and friction permit accurate and precise starting and stopping, valuable characteristics in devices such as the Liberty Valve Operator, shown here. These advantages are found *only* in the ball type of anti-friction bearing.

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Manufacturers will find New Departure Engineering Bulletins on "Ball Bearings and their Universal Application" of great assistance in solving bearing problems. These are supplied without obligation at your request. Write for them now. Resident representatives are available for consultation on all subjects pertaining to bearing engineering. Interviews can be quickly arranged, if you will say the word.



New Departure Quality Ball Bearings

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To Warn You of Wear on Machines

There are times when machines seem to wear abnormally; either the production is falling down or the quality is falling off.

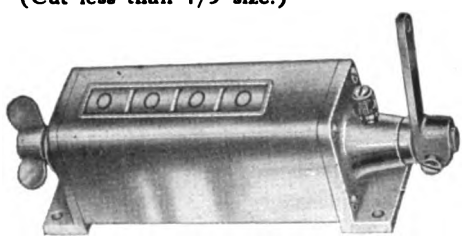
To keep a check on machine *condition,* get daily production-reports from *each* machine. Tune up the machine or step up the operator when you get the trouble-warning from a

Veeder

Here's the special Veeder Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable.



Built especially for recording the product of heavy-duty machinery where a reciprocating movement registers an operation. Strong stops limit the movement of the lever to 45 degrees or 1/8 turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price $18.00—list. (Cut less than 1/3 size.)



The above *Set-back Rotary Ratchet Counter* counts one for each oscillation of the lever, as required in counting the product of presses and metal-stamping machinery. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as needed. Price, with four figures as illustrated, $11.50 (subject to discount). Equipped with lock and keys to prevent tampering with the record, $2 extra. (Cut 1/2 size.) Set-back *Revolution* Counter of similar model, price $10 (list). Smaller counters from $2.00 up.

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Cleveland Machine Tool Show

(*Continued from page* 14)

Government Departments, the railroads, the leading motor car makers, the steel, electric, oil, paint, aluminum and brass companies, the rubber corporations, chemists, domestic machine manufacturers—in fact, from almost every industry which might conceivably be interested in the acquisition of machine tools. Foreign nations were generally represented by their engineers, some of whom came from England, France, Japan, Germany, Russia, Sweden and from Latin America to view the exhibits.

All were evidently bent on business as the number of actual sales which were made indicate. There were scarcely any idle sight-seers except on the single night when the exposition was opened. It seemed to one observer that there was more of a mixture of curiosity seekers at that evening session. This, however, seems to be the general rule at expositions.

From the engineer's standpoint the most impressive feature of the show was the intensive refinement which machine tools have undergone during a comparatively few recent years. As one shop foreman expressed it to his companion, "this doesn't look like a machine shop; it's more like an engine room." That about describes it. A 1927 model, automatic, turret-lathe fitted with all the accessories which have now become accepted practice looks considerably more like an engine than it does like a lathe. A few years ago, nobody would have thought of universal direct-drive with push-button control, roller bearings, multiple disc clutches and lacquer finishes in connection with standard machine tool models. Yet, there were few machines exhibited at the show which did not have one or all of these refinements in addition to all the automatic features, mechanical ingenuity could develop.

Hydraulic Operation a New Feature

One of the most important advances in mechanical design introduced at this exposition is the use of hydraulic power to operate the tools and their accessories. One of the machines so equipped is a large automatic miller in which the feed is under hydraulic control. It can be so adjusted that as the volume of metal to be milled increases, i. e., as the cut gets heavier, the feed is automatically decreased.

Another exhibitor showed a multiple spindle drill with a hydraulic feed. Another introduced a hydraulically-operated lathe chuck.

There were several new combination punch and shears introduced, all of them fitted to fabricate almost every conceivable flat bar or structural shape.

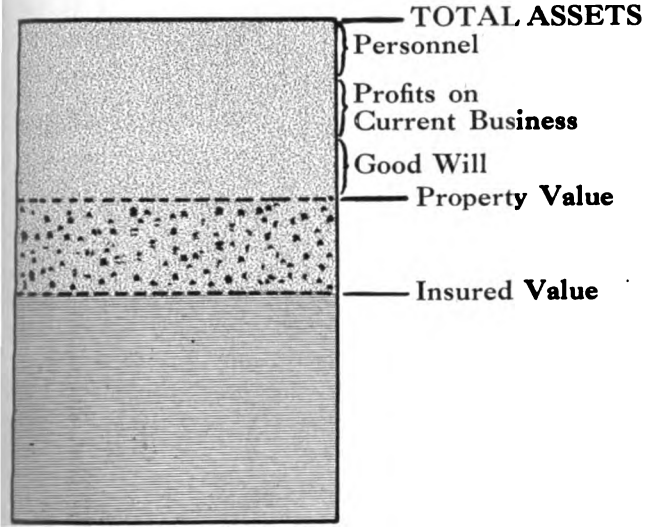
In addition to the standard forms of grinders, there were a number of relatively new models displayed with special attachments as exhausts, magnetic chucks, generators and wet-grinding attachments. Another exhibitor showed a centrifugal separator for removing the oil from borings and turnings from automatics. It is claimed that enough oil could be recovered to pay for the machine in six months. Still another showed an electric power scraping machine. The scraping knife is held in the

(*Continued on page* 38)

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Are you protecting the cream of your assets?

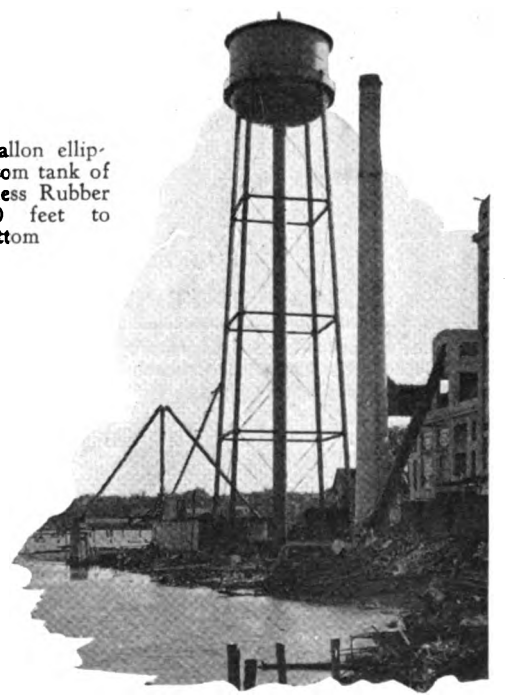


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100,000 gallon ellipsoidal-bottom tank of the Seamless Rubber Co., 110 feet to bottom

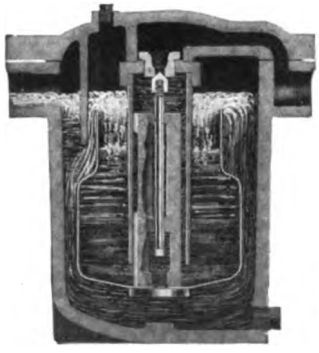
Chicago Bridge & Iron Works

Chicago, 2465 Old Colony Bldg.
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Cleveland, 2238 Union Trust Bldg.
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Atlanta, 1023 Healey Bldg.
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HORTON TANKS

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9. MONEL METAL VALVES AND SEATS.
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CHICAGO

For products

(*Continued from page* 36)

hand just as in handscraping, the power being supplied by a motor.

Among the cutting tools, there were instructive exhibits of all kinds of milling cutters and hobs, motor-driven, burring attachments, and broaches, together with plain and adjustable-blade reamers, taps, dies and drills.

The exhibits of portable electric and pneumatic tools showed that in this branch of mechanical equipment, great strides had been made, particularly in the direction of increasing the compactness of the motor and its case. The new high-cycle motor and the frequency changer sets for use in connection with it, were shown in various applications, by several exhibitors.

Another feature at the show that impressed the visitor was the enormous growth in the use of ball and roller bearings in all the industries. Railroad cars, small motors and machine tools alike seemed to be increasingly equipped with this type of bearing.

The exposition was under the supervision of an Association Committee on Expositions, comprising: Chairman, J. Wallace Carrel, of the Lodge and Shipley Machine Tool Co.; P. E. Bliss, of the Warner & Swasey Co.; O. B. Iles, of the International Machine Tool Co.; H. W. Dunbar, of the Norton Co., and E. J. Kearney, of the Kearney & Trecker Corp.

Detroit Steel Treating Show

(*Continued from page* 15)

type of welder was its adaptability to high production. One such machine, when using an automatic drive, was able to make 110 welds a minute.

In addition to the exhibits of individual manufacturers of furnaces, the American Gas Association had a display which included practically all types of combustion systems including standard types of furnaces operating under each system. In addition, there was a completely outfitted metallurgical laboratory, in which the latest automatic sample polishing machines, hardness testers, and microscopes were exhibited.

The National Electric Light Association showed continuous motion pictures of the application of electricity to heat treating. All the installations were shown in actual production, among them being those of the Ford Motor Company and Dodge Brothers.

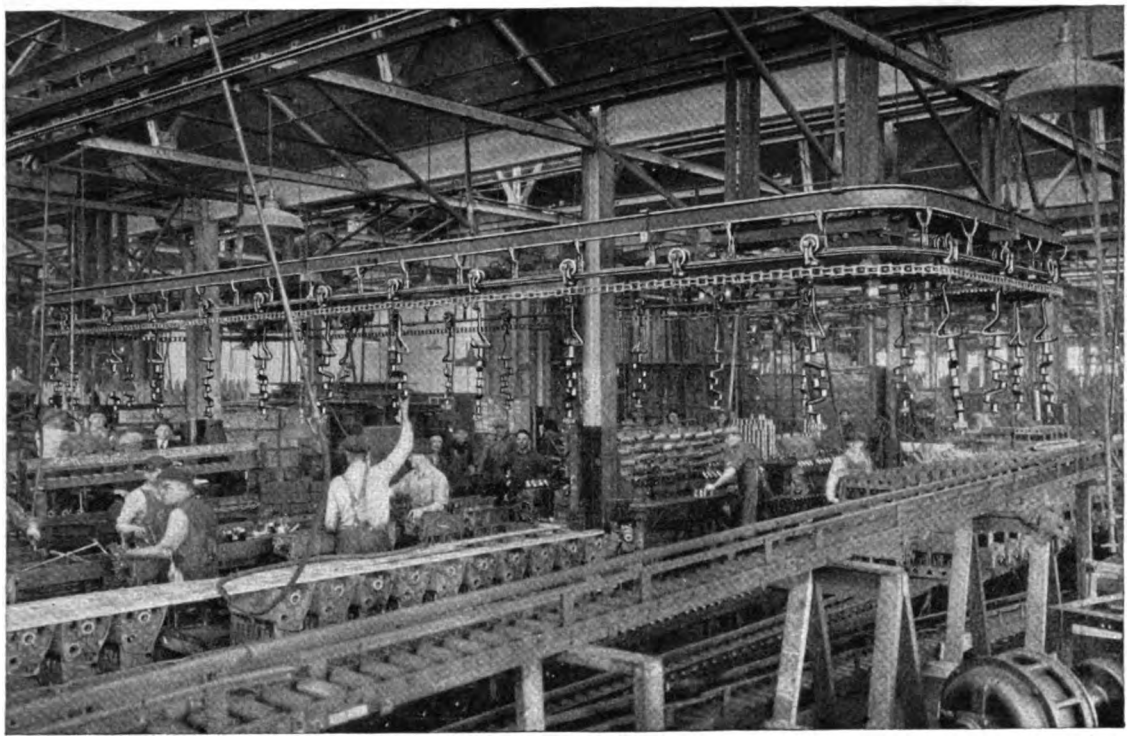
There were interesting exhibits of various kinds of heat insulation, of firebrick and clay products for lining furnaces. Special annealing furnace linings of high thermo-conductivity and refractoriness were shown by one manufacturer and attracted considerable attention. The exhibits of the steel manufacturers included about every variety of iron and steel suitable for heat treatment, including hot-rolled, coal-drawn and drop forged tool steel and other finished products. There were extensive showings of forge and foundry equipment, including drop hammers, carburizing pots, oil burners, hoists and forges.

In addition to these, there were exhibits by the manufacturers of machine tools used in connection with the machining of treated steel.

During the convention week, inspection trips had been arranged to the leading motor-car plants.

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The Louden Overhead Track and Trolley System pictured above is saving time, energy, and money in one of the large Automotive plants. Here Louden Monorail is used in conjunction with a motor driven chain carrying 200 crank shafts

at this very moment— put your mind on this "*single track*"!

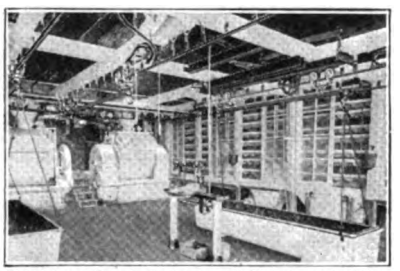
Is the ceiling in your plant a broad expanse of wasted space? Is your material still being moved laboriously and at great expense by hand? Then you are ignoring one of the greatest sources of economy and profits in your plant. *You need to investigate the wonders of economy accomplished by the Louden Industrial Monorail System of Overhead Lifting and Carrying.*

Your ceiling can be made the right of way for a Louden Monorail which will speed up the handling of your product in every stage of its manufacture. It will reduce handling charges, relieve congestion on the floor, prevent accidents, and eliminate the exhausting labor of lifting and hauling. That one rail on the ceiling is worth twenty men on the floor! It binds departments together in a unit and coordinates their work. By increasing productive capacity the expense of new building is postponed or saved.

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Just off the press. It tells a remarkable story about the conveying of materials in process of manufacture, handling finished products, etc. 56 pages of dimensioned drawings and 72 pages illustrating application of Louden Monorail to many types of work, including yours, complete information on track, trolleys, switches, dipping machines, cranes, monorail scales, track hoists, etc. Shows how to cut production costs. Write for a copy of this valuable book. No cost or obligation.

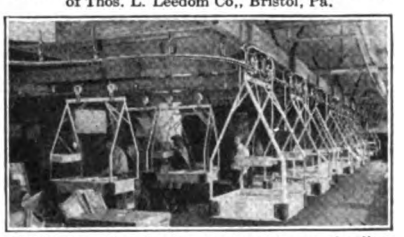
The Louden Monorail System is adaptable to any plant, large or small, to the handling of practically any material or product up to 2000 pounds. Its trouble-proof perfection is the result of years of patient development and the test of actual service in thousands of plants. A variety of uses and a wide flexibility of application make it one of the most definite reducers of overhead costs that can be found for any industry. It will prove successful in your plant. *It will make your ceiling a right of way to greater dividends.*



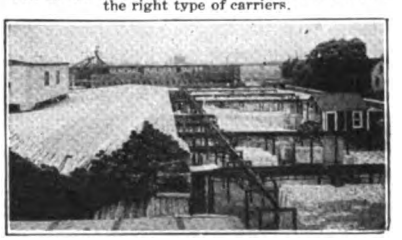
This Monorail scale for beam weighing is part of the Louden System that holds down costs for the Harris-Boyer Baking Co., Johnstown, Pa. Loaded troughs weigh about 1500 pounds.



Louden Monorail is making big savings in the textile field. Chain drive trolley conveyor system in plant of Thos. L. Leedom Co., Bristol, Pa.



"All orders filled the day received" is a good policy made possible in the plant of the American Products Co., by the installation of a Louden Monorail and the right type of carriers.



Louden Monorail used inside and outside to speed up the handling of concrete blocks for R. E. Hamilton Sons, Detroit, Mich.

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INDUSTRIAL MONORAIL SYSTEMS

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DURABILITY!—Have you taken it into account in buying shovels? If you have not, make a test of H. K. Wood's Mo-*lyb*-den-um Steel Shovels on any job that seems to be using too many shovels.

One of our distributors—they are located in all parts of the country—will make it easy for you to observe by actual contrast on your operation how the Moly out-wears any other shovel and how it will out-last half a dozen ordinary shovels and still remain a good shovel.

Just as the Moly has greater durability so it has greater adaptability because it is properly made for a particular job.

Light weight—lighter than any other shovel for equal capacity and a given strength—has a considerable effect on shoveling expense, because shovelers get more work done with less effort.

How the Moly saves money on big and little jobs by reducing the cost of shovels and lowering shoveling expense will be proved to you, if you will ask us to tell you about specific instances in your particular activity.

THE WOOD SHOVEL AND TOOL CO.
Piqua, Ohio, U. S.

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Servicing Machine Tools

(*Continued from page* 19)

once, that the price curve has been practically horizontal, whereas that showing the demand for service has been steadily going up, and that there has been an increasing gap between prices and service,—it simply means that the manufacturer is compelled to increase his service cutting into his margin of profit. The manufacturer of automatic lathes, indicates that the percentage of machines furnished with special features and tooling equipment in comparison with his total sales is increasing each year. The increasing burden of special machines, as against standard products and the necessity of making special engineering service estimates in conjunction with these special machines, is a source of constant concern. The cost of engineering and the subsequent installation and testing out equipment frequently leaves little or no margin of profit.

A manufacturer of gear cutters who was approached on this subject, while not having the same problems, does have occasion to furnish special fixtures which make his machine semi-special. However, he felt that engineering service should be continued and that it is a valuable help in the sale of and the use of machine tools.

Startling discoveries are made in some plants. In one, during the past six years the demand for engineering service increased 100%, while the manufacturer's sales fell off 33% and prices rose only 20%. Facts of this kind certainly deserve careful consideration on the part of all users of machine tools, who have been enjoying engineering service. Demand for, and the cost of service, are increasing at a faster rate than the prices paid for the tools.

Visitors at the 1927 Machine Tool Exposition in Cleveland were struck with the tremendous strides which have been made in the production of new designs, the application of automatic methods on standard machines with these designs, and new machines which are now available. Engineering service will play a large part in the next two or three years in the successful application of these new machines. This sort of service should be continued, and still further developed. However, to encourage this sort of development as well as further development of better methods, it is obvious that the machine tool builder must be reasonably compensated.

Important progress in a dozen major industries is described in the Year Book of the American Engineering Standards Committee which has just been issued.

The following table gives a bird's eye view of the status which has been reached in the major lines of work:

Group	Number of projects	Projects approved
Civil Engineering and Building Trades	36	19
Mechanical	61	19
Electrical	39	11
Automotive	4	3
Transportation	10	9
Naval Architecture and Marine Engineering—Shipbuilding	1	
Ferrous Metallurgy	9	7
Non-Ferrous Metallurgy	14	10
Chemical	12	10
Textile	3	1
Mining	20	5
Wood	5	3
Pulp and paper	2	1
Miscellaneous	22	5
Total	238	103

The number of projects has increased from 212 to 238 and the number of approved standards from 82 to 103 during the year.

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Arguto Oilless Bearings Prolong Machine Life

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"HAVE used 'Arguto' Bearings for over *twenty-five years*. There is no doubt in *my* mind that 'Argutos' have the staying properties." So wrote one customer. Just one of countless letters we receive lauding the wonderful performance, the long life and the elimination of the cares and troubles which beset the user of machinery when operating with other than Arguto Bushings and Bearings.



Arguto—the non-metallic Bearing that requires no oil and lasts for years

Arguto Bearings didn't "just happen". They represent years of development. Back in 1890 we first experimented with the elimination of oil for journals of small electric motors, spindles for textile machinery, etc. It was not until 1896 that the world renowned scientific society, The Franklin Institute, after a long period of tests, awarded us the Franklin Medal and Premium. Also Gold Medals of International Exhibitions.

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USUALLY you don't. Seldom was the little pea where you expected. Almost invariably the hand proved itself quicker than the eye. The shell game was a gamble with chance; the odds were decidedly against you.

Industrial cleaning, too, was once a matter of chance. The haphazard potash, lye or caustic tank of former days rarely produced the desired results. The odds, in fact, were heavily in favor of lost time and wasted labor, costly rehandling, retarded production, increased costs and a consequent shrinking of profit.

How different today! Scientific Oakite materials and methods have made positive, pre-determined cleaning a certainty. Parts in process are always ready for subsequent operations; handling is simplified; waste eliminated; production accelerated. Plant cleaning operations are now done economically, quickly, thoroughly.

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Industrial Cleaning Materic 's

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Unit Type Heaters

(Continued from page 29)

After having determined upon the general type of heater to be employed the buyer is next concerned with the mechanical features of the various makes from which he can choose. The first matter of importance is to make certain that the blower or fan mechanism is well constructed and well balanced to reduce noise and to produce the greatest movement of air with the least power. In general the low discharge velocity heaters employ disc fans which are not as efficient as the housed centrifugal blowers employed in the high discharge velocity units.

Whether the heater is of the draw-through or the blow-through type, that is whether the fan forces the air through the heater coils or draws it through is of no great importance to the buyer, assuming that the units of each type are actually of the same capacity, but it generally means that the blow-through type must have a larger heating element than the draw-through type and thus is likely to take up a slightly greater volume of space.

High Speed Motors Most Desirable

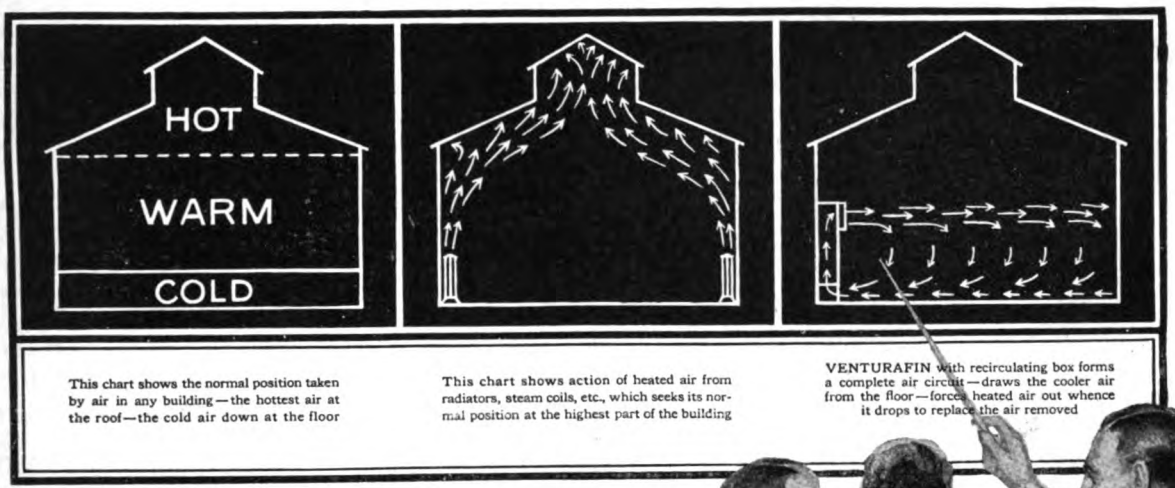
In checking up on the motors the buyer will find certain types running at very low speed from 650 to 1,200 r.p.m. and other types running at speeds from 1,500 to 1,750 r.p.m. The slower motors are used in the fan type units because of their greater quietness but slow speed motors are relatively expensive, are seldom carried in stock by electric supply houses, and therefore in case of a breakdown the unit heater motor cannot be as readily replaced as would be the case if the standard speed motors of say 1,750 r.p.m. were used. Furthermore, if the manufacturer is standardizing on any one make or type of motor it is well to select his unit heaters so that his standard motor can be applied to this mechanism as well as to other machines in the plant in order that the matter of replacement and repairs can be simplified. Too great importance should not be placed on this matter because fan service is not a heavy load upon a motor and there should be no great likelihood of replacing these units if a good quality make is selected in the first place.

Another factor that should be given weight with respect to both motors and fans is the accessibility of bearings for oiling and adjustment or repair, and the protection of both the motor and the bearings from dust. The ideal design is one that has the bearings and the motor entirely outside the line of air flow; preferably outside the housing or casing. Unit heaters of the "blow-through" type have the motors exposed on the cool side of the heater coil and are generally accessible. They are, of course, in the air stream, if of the disc fan type and hence should be properly dust-proofed. Units of the draw through type using disc fans invariably have the motors and bearings in the air stream, and on the hot side; these require special housing with the motor independently ventilated from the outer air. Units of the overhead type, with the motor above the coils, are subject to the natural rise of heat from the coils when the motor is not running and should always have ball bearings and specially impregnated motors to withstand the severe operating conditions. The housed centrifugal fan, because of its peripheral discharge, is the best type

(Continued on page 44)

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Men Are Not Flies
- so why heat the ceiling ?





The Venturafin Method FORCES heat where you want it

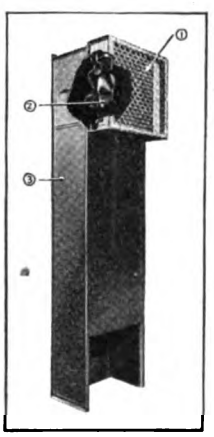
If men could walk about on ceilings like flies, the average heating system would be ideal. But men must stay on the floor—yet heat rises to the roof.

Study the charts shown above. They show the flow of heated air from various types of heating equipment—and point out the great superiority of the Venturafin Method of Unit Heating.

The Venturafin Method gives positive heat control—forces heat into production areas where you want it and as much as you want—eliminates "heat pockets," "cold spots" and distributes heat evenly.

It has more than five times the efficiency of ordinary radiation, steam coils, etc., 1/10 the weight and occupies only ¼ the space. It is the ideal system for industrial buildings of almost every type and description—wherever steam is available. Because of its easy and quick installation, light weight and tremendous efficiency, it is cheaper to buy, install and operate. Over 15,000 units are in use.

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Venturafin consists of the following major parts: (1) Copper fin-heater—with five times the radiating efficiency of ordinary iron coils. (2) The famous American Blower Ventura Fan (electrically driven). (3) Air recirculating box.

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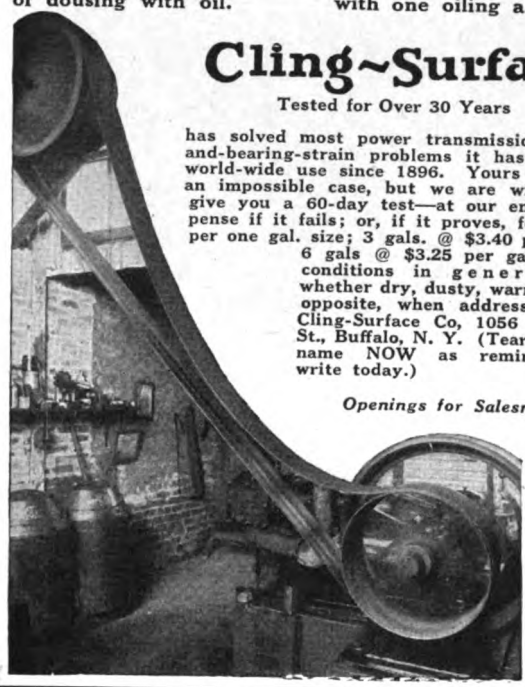
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Formerly this 8 in. belt (20 H.P. at 1350 ft. p.m.) was tightened to the breaking point trying to prevent slip—with bearings going wrong in spite of dousing with oil.

But for years and years, the very same belt after treatment with Cling-Surface never slipped the run with 20 ins. of slack, and the bearings ran cool with one oiling a day.



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THE GERSON STEWART CORP.
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Specialists in Products For Industrial Sanitation

For products not a

(*Continued from page 42*)

from this point of view since it very readily permits keeping the motor and bearings entirely outside the air stream.

All sorts of heating elements are offered each of them suited to the purpose, but having varying characteristics as to strength, serviceability, weight, bulk and cost. When space economy is of paramount importance the choice is between several types of brass, copper, or aluminum radiators, of high heating efficiency and light weight but necessarily not as suited to resist rugged service conditions as the bulkier iron pipe coils. Of these non-ferrous elements, the one in widest use consists of brass tubes wound spirally with thin metal fins which vastly increase the radiating surface of the pipes. They are light in weight, they are claimed to be able to resist freezing, and are suitable for low pressures and for places where they are protected from injury.

Similar in type are heating elements composed of cells exactly like those used in automobile radiators. Another variation is a cast metal steam way with large metal fins mechanically bonded to the exterior. In all cases these light weight compact elements are best suited to low pressures, although one or two makers claim their products usable on steam pressures up to 150 pounds or so.

The heavier and bulkier types generally consist of iron or steel pipe of "U" shape, spiral, or other form, arranged in banks between cast iron or steel headers. The strongest are those made of steel pipe welded to steel headers, for this construction permits shop testing with pressures up to 2,000 lbs. Certainly such tests assure the user of freedom from trouble after the coils are in his establishment. A more frequent, because lest costly type consists of pipes threaded to the headers. When carefully manufactured they are wholly suitable, but every threaded connection is an incipient weak point where trouble might develop under severe service. Whether these pipes are of one shape or another is relatively unimportant so long as they are properly staggered in the banks to cause a wiping action of the air passing through them, and provided they are arranged to drain quickly.

Cast iron radiation of the "vento" type so familiar to all heating engineers is now little used for unit heaters because of its excessive bulk and weight and its limitation to low pressures.

Some Special Types of Unit Heater

Among the special types of heating elements are electric radiators and direct fired unit heaters. Electric heaters are, of course, expensive to operate and their use is limited to places where electricity is very cheap or where an installation of one or two units is needed and it is too expensive to install steam boilers or connections.

Direct fired unit heaters consist of a furnace burning wood, coal, gas, or oil similar to the ordinary household hot air furnace, with the addition of a fan or blower, to force the circulation of air around the outside of the firepot and thence into the room. They are necessarily bulky, require a flue connection, and are only recommended for temporary use or for heating remote small buildings where they might be cheaper to install than a steam boiler.

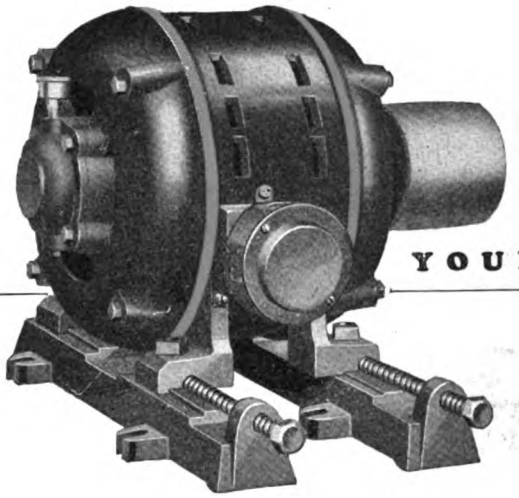
In buying unit heaters the casing is perhaps the least important element, for every type on the market seems

(*Continued on page 46*)

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(Continued from page 44)

to have a casing suited to its purpose, though some of the better grade units present a better finished appearance and are of sturdier materials than the competitive low priced types. Nevertheless, the careful buyer should note the difference between makes with respect to deflectors on the discharge side of low velocity fan type units. These deflectors are presumed to turn the air stream toward the floor to help counteract its tendency to rise as soon as it emerges from the unit. In this respect they are relatively useless—in fact, some types only are an added impedence. Fixed deflectors are all right—if deflectors are found to be of any benefit, provided they are set at the best angle; but adjustable deflectors have real usefulness in the summer time. Then, when the fans are driven without steam on the coils for circulating the air, the deflectors do help to throw the air stream toward the floor, and improve the effect of these low discharge velocity units. Hence if deflectors are present they should preferably be adjustable so they can be turned out of the way in winter, and set to the most effective position in the summer.

Deflectors to direct the air stream in a horizontal plane are of course often desirable to cause a flow toward any desired part of the room. Diffusers, sending the air in all directions, are of only rare application.

Automatic Control Almost Essential

Thermostatic control of unit heaters is generally highly desirable. There are many types of control systems on the market, and their selection is beyond the scope of this article. In general, however, the thermostat should be set remote from the unit heater it controls, and not directly exposed to the air stream. The far side of a column, for example, about two-thirds of the distance of maximum air flow of the heater, is generally good practice. The thermostats may either control the motor alone, or both motor and steam supply. If the former, the heater coils continue to act as direct radiation, which in some installations is desirable, while in others it may result in overheating with the consequent temptation to turn off the steam manually. If this happens and the temperature drops before some one remembers to turn it on again, the thermostats may set all the fans working, further cooling off the room until the temperature drop is noticed and some one realizes the cause. Preferably the thermostat should control the steam supply also, as more uniform results are obtained and no special hot spots develop when the fans are idle. This type of control is particularly desirable on floor type unit heaters, if employees are working in close proximity to the heater.

With these facts concerning the mechanical and engineering characteristics of unit heaters as a general background, we can turn to their practical application in selecting units for any specific problem.

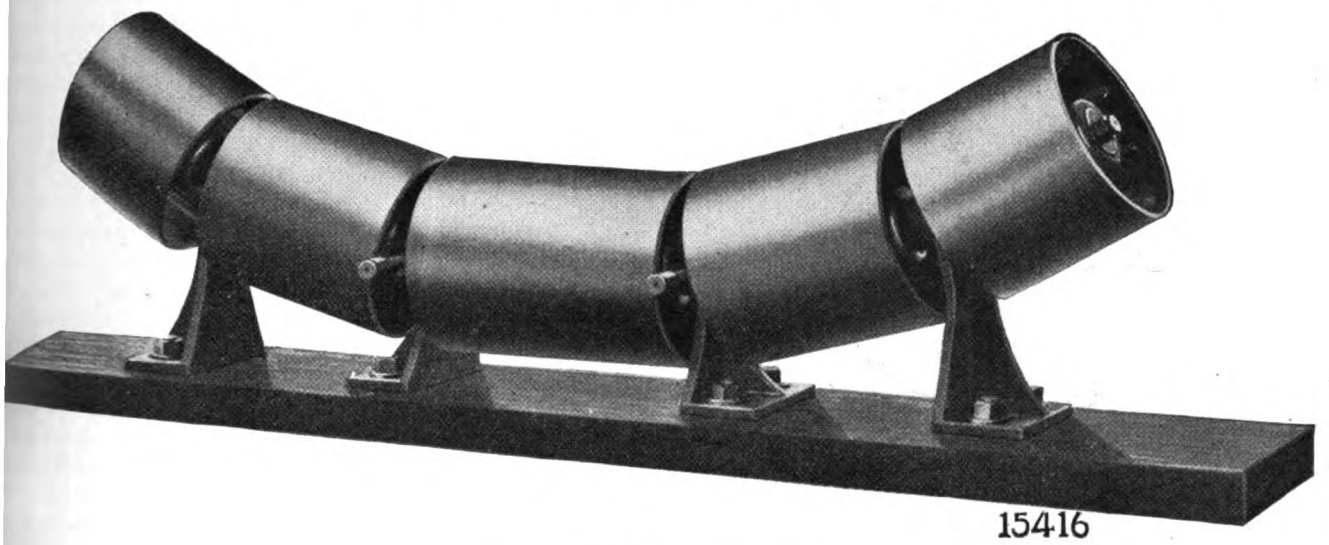
In practically every industrial problem the question of cost is of paramount importance. The common mistake is to consider first cost alone; neglecting operating and maintenance cost, depreciation and obsolescence. The greatest care should be exercised in this respect in buying unit heaters, for the price range per unit is very large, even for units of apparently equal rated capacity, and yet the highest price unit may be by far the cheapest in the long run.

Remember that the price of the unit is but one elemen

(Continued on page 48)

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Abrasives for Every Purpose

(Continued from page 46)

of cost. The installation of the unit is another of equal importance. One large unit can often do the work of ten small ones, and may do it better; obviously the cost of hooking up and maintaining one unit is less than that of ten. If new steam lines and power connections are to be run, the amount of main lines and returns may be cut to a surprisingly low footage if the units are few in number and they are arranged in the building with reference to proximity to the main steam supply.

A second factor is the sturdiness and durability of the unit. Compared with direct radiation, unit heaters have tremendous capacity for a given amount of space occupied. Even moderate size units are equal to a thousand or more square feet of direct radiation, and, of course, among the larger sizes there are units having a capacity of over 750,000 B. t. u. What happens then, if a unit fails due to leaks, breakage, or motor blowout? Whether small units or large are used, the best of materials and construction should be selected, for high grade heaters should never fail with reasonable maintenance, while cheaply built units may develop faults after very brief service, and the failure of a single unit may impose an impossible load on the others.

Another factor is power consumption; but if this is figured on the basis of manufacturers ratings it may be misleading. As noted above, the high discharge velocity types may seem to have a low c. f. m. (cubic feet per minute) rating in proportion to horsepower as compared with the fan type low velocity discharge heaters, but because the former set up induced air currents of great effectiveness they are actually the more efficient.

Selection of Heaters No Amateur's Job

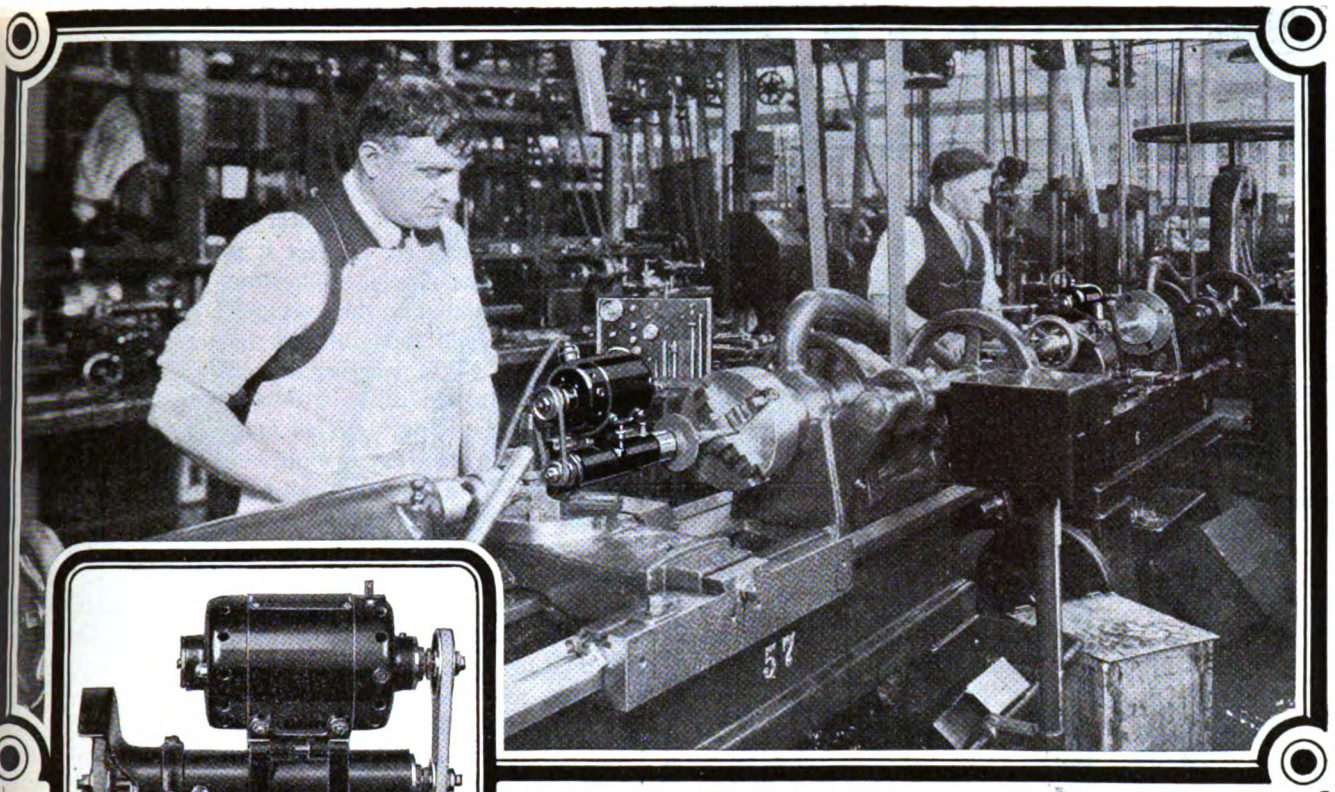
The buyer has recourse to two methods in selecting unit heaters for a given problem. The proper course is to engage an impartial engineer to design the most advantageous system and to specify the heaters to be employed. The alternative is to make a study of unit heaters, selecting those of the type indicated in the above discussion as being most appropriate, and then having the manufacturer's sales engineers independently submit recommendations for the best layout and installation of their respective products. The buyer can then compare the original cost of the units, estimate the cost of the piping necessary for each scheme, estimate the cost of setting up and making electrical connections to the several units, and comparing the current consumption of the motors to be used with each manufacturer's layout. The resulting cost figures should not be the final guide, but they should be taken into consideration along with the quality of product offered by the competing makers.

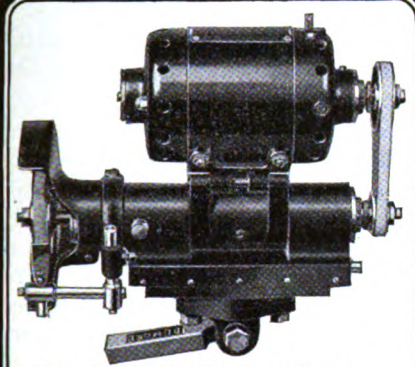
Once the selection is made the installation should accord with the manufacturer's recommendations as closely as possible for there are very many factors having a bearing on the proper placing of units, and the arrangement best for one type of heater might be very bad for another.

It should be borne in mind that if several rooms in buildings are to be equipped with units several different types might prove more advantageous than one type in all the places. Hence if manufacturers' recommendations are made the basis of selection the buyer would do well to subdivide his problem, and consider each room in a building separately, buying if it seems advantageous, so

(Continued on page 50)

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Accurate Grinding Internal or External

INTERNAL or external dimensions to tolerances of .0001", or closer, can be produced with Dumore Grinders. These adaptable tools operate on either alternating or direct current. They can be used on any machine tool while the work is still set up and enable any machine shop or tool room to turn out precision work to any required degree of accuracy.

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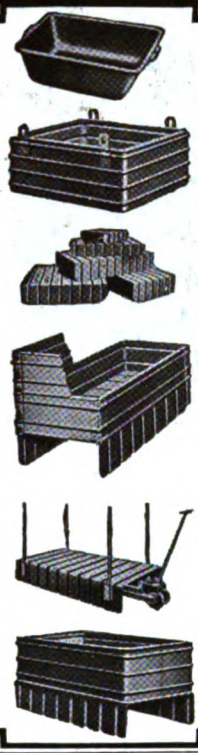
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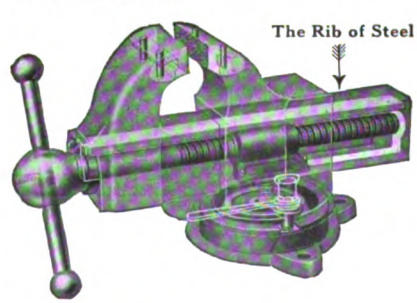
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Meriden, Conn., U. S. A.

For products this issue write Industry Illustrated

(*Continued from page* 48)

eral makes or types of heaters. Of course, professional engineer counsel is free to make such selections without prejudice, and is to be preferred over the alternative method. It is not uncommon for a well informed heating engineer to specify several types of heaters for a single building, even using different types in a single room when conditions are best served by such action.

Before leaving the subject it might be of interest to point out some special applications of unit heaters that may be unfamiliar to the average buyer.

Practically all types of unit heaters serve a valuable purpose in warm weather by circulating the air with the steam turned off and thus increasing the comfort within the building. Air in motion, even at high temperature and humidity is more comfortable than still air, and there is a definite pleasant sense of coolness on sultry summer days when the fans maintain a regular movement of the air, even though they do not actually lower its temperature.

Unit heaters are often equipped to draw part or all of their air from outside the building, thus functioning as ventilating systems when so desired.

Units are now made with air conditioning equipment built in to the heater, including air washing, humidifying and de-humidifying apparatus. This type provides an economical means of maintaining automatically a predetermined temperature and humidity within a room and may be highly desirable in special departments of a plant where the expense of such artificial weather-making for the entire plant might be too great. In a printing shop, for example, the stock-room and color press department might be segregated and such units installed to insure perfect register during the successive color impressions by keeping the paper at a fixed moisture content.

A novel use of unit heaters is for heating basements or other rooms below the level of the boiler, or at least too low for a direct gravity return to the boiler. Units of the housed centrifugal blower type may be set on the floor above, at a grade where a gravity return to the boiler is easy, and inverted so as to force their discharge downward into the room below. A garage having a basement storage area was recently so equipped, the units having their discharge conducted through metal ducts to the basement floor, thus not only heating the space but diluting and removing the heavy poisonous gases likely to settle on the floor.

To Supplement Direct Radiation

One great opportunity offered by unit heaters that should not be overlooked is their effectiveness for curing cold spots in a room now heated by direct radiation. Often a single small unit can be hooked up with the existing steam mains and arranged to send its discharge into a corner that has always proven hard to heat up, or toward a door frequently used that is forever admitting a cold blast that can be felt throughout the room. Plant engineers and superintendents may well jot down this thought, for it may readily correct a troublesome condition impairing the health of employees.

In fact the local application of warm air for any sort of drying or heating is readily accomplished with unit heaters. One installation of interest was their use in an auto body paint shop, where a pair of units on either side of the production line speeded up the drying of

(*Continued on page* 52)

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Speed + Power

Worcester Polytechnic Institute
Worcester, Massachusetts

Department of Mechanical Engineering

November 30, 1926

Clipper Belt Lacer Company
Grand Rapids
Michigan

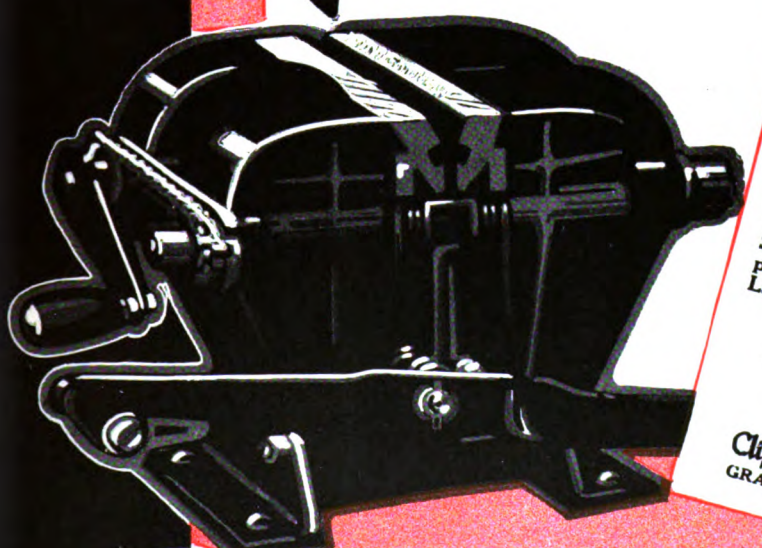
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A #8 Clipper Belt Lacer of new design tested in our laboratories at Worcester Polytechnic Institute showed that a normal man could exert a jaw pressure of 45,900 lbs. when operating the device with the standard double ended crank.

Yours very truly,

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Clipper products satisfy any belt lacing requirement.

QUALITY BELT LACING

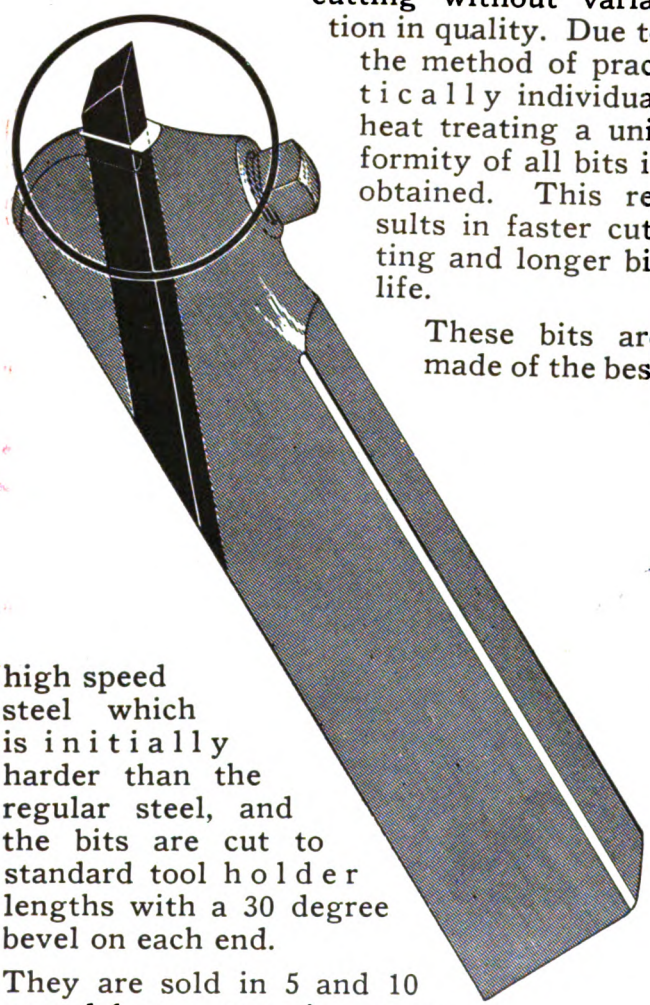
Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

Clipper
No 8 Speed Lacer

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Consistent Standard In Cutting with no variation in Quality

Simonds High Speed Steel Tool Holder Bits do not give an exceptional run in only a few instances, but they are made to maintain a consistent standard in cutting without variation in quality. Due to the method of practically individual heat treating a uniformity of all bits is obtained. This results in faster cutting and longer bit life.



These bits are made of the best high speed steel which is initially harder than the regular steel, and the bits are cut to standard tool holder lengths with a 30 degree bevel on each end.

They are sold in 5 and 10 **pound boxes, one size or assorted sizes as desired.**

Simonds Saw and Steel Company

ESTABLISHED 1832—FITCHBURG, MASS.

Chicago, Ill. Boston, Mass. Detroit, Mich. New York City
New Orleans, La. Lockport, N. Y. Memphis, Tenn. Atlanta, Ga.
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Toronto, Ont. Vancouver, B. C. St. John, N. B.

SIMONDS

High Speed Steel Tool Holder Bits

For products this issue write Industry Illustrated

(Continued from page 50)

lacquer and paint to such effect that the plant nearly doubled its capacity, and at a cost far less than the installation of traveling bake ovens. Unit heaters, like other new mechanical appliances, are destined to find many other ingenious applications that were never conceived when the first came into use. There are two bugaboos to mention that competing salesmen sometimes throw at each other to the buyer's confusion. One is the dust and draft problem and the other is the noise problem. Neither amounts to much.

Makers of the suspended or non-recirculating type are prone to disparage the recirculating heaters having a floor intake by claiming the latter pick up and disseminate floor dust. The true situation is that either type will keep circulating whatever dust may be suspended in the air; so in fact will direct radiation as may be proven by noting the dust streaks on the walls above radiators in any home that has not been recently redecorated. Dust that is heavy enough to settle will not be picked up from the floor by the recirculating type for the reason that the intake velocity is always much lower than the discharge velocity; a matter accomplished by having the intake appertures of adequate size. By actual test, a unit having a discharge velocity in excess of two thousand feet per minute showed a maximum intake velocity of five hundred feet per minute, and flour dust, bits of tissue paper and other light substances laid on the floor directly at the intake were not disturbed when the unit was working at top speed.

This dust problem is related to the draft bugaboo, the same group of makers claiming the recirculating type creates floor drafts injurious to workers. Within two or three feet of the floor intake the air movement is so slight as to be unnoticed by workers standing nearby. Furthermore, the very fact that the recirculating type tends to a more uniform temperature distribution through the various strata means that they maintain a higher temperature along the floor than the non-recirculating type, hence cold feet is less likely to be a complaint with the recirculating heaters than with the others.

The question of noise is a relative one. In a quiet room the swish of air and the sound of the motors and blowers is readily heard with units having high speed motors. In a factory or busy shop the sound is lost among the other noises, and cannot be considered a detriment. Where quietness is imperative, as in an office or drafting room, the problem calls for the use of low speed fans and motors, with perfectly balanced rotating parts. If the sound of a desk fan in the summer time is not objectionable, then unit heaters may be employed without fear of their sound being thought of after the first few minutes they are in operation.

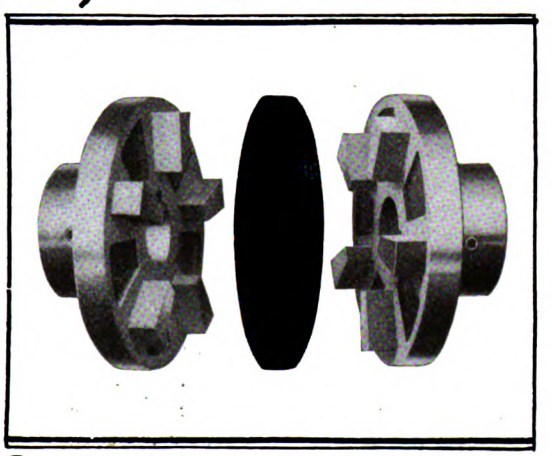
Taking all factors into consideration, unit heaters represent a very marked advance in heating practice. They save from 10% to 40% in first cost compared with direct radiation, and they save from 5% to 15% in operating expense.



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POWER is a destructive MORON
unless correctly coupled to its load!



WOOD'S flexible couplings

—form a perfect safeguard between the power and its goal by absorbing the destructive surges in a specially constructed leather disc, which provides flexibility in every direction.

Two cast iron flanges with lugs cast integral dovetail into holes in the leather disc forming a coupling that is as strong as solid steel, yet retaining the protective flexibility between direct connected motor and machine.

Always specify WOOD'S flexible couplings.

SEVENTY YEARS of SERVICE 1857 1927 T.B. WOOD'S SONS CO. POWER TRANSMISSION MACHINERY CHAMBERSBURG, PA.

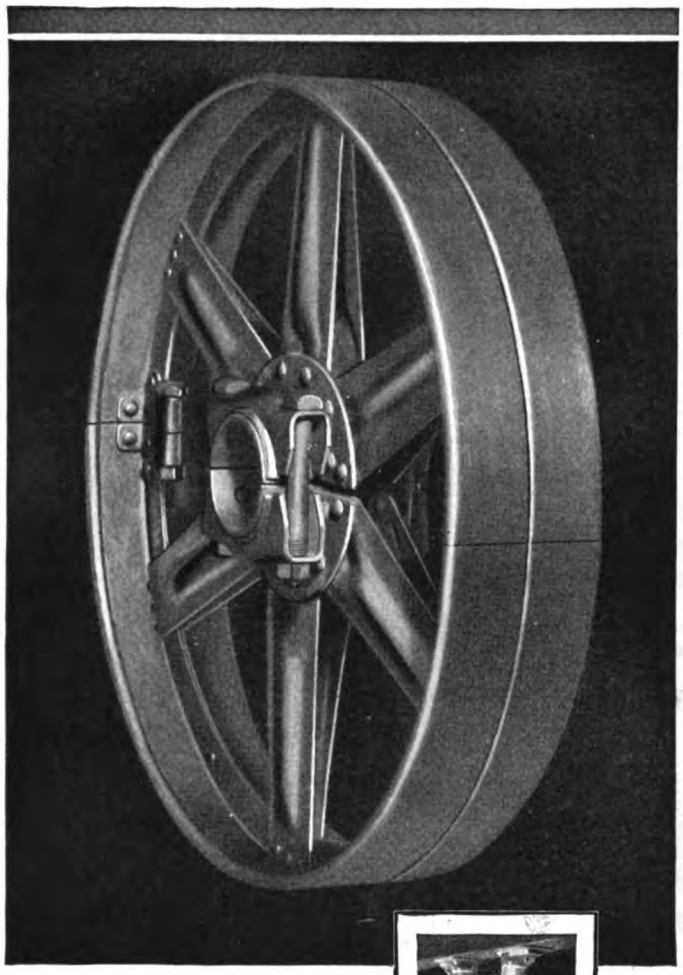
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Rope Drives
Speed Reducers
Ball Bearings

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For
Greater Power

POWER does *more* useful work with "American" Steel Split Pulleys. Made of pressed steel for strength and light weight, they reduce line shaft loads and lessen hazard.

Split construction makes installation easy and quick. Just clamp on the two halves.

Save power, time and installation labor with these power transmission units. Details on request.

The American Pulley Company

Manufacturers of Steel Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

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For nearest distributor see MacRae's Blue Book

AMERICAN
PRESSED STEEL HANGERS | STEEL SPLIT PULLEY
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Plain Bearings

(*Continued from page* 33)

are occasionally turned down by hand. If pressure fittings and grease guns are used, it is possible to force the grease under much higher pressure to the bearing surfaces and also to force out dirt which may have lodged between shaft and bearing.

Oil is applied in the following manner:

(A) *Drop Lubrication*

(1) As occasional lubrication by means of an oil can through an oil hole with or without an oil wick.

(2) Continuous wick feed from an oil reservoir. The amount of oil fed depends upon the size of the wick.

(3) Continuous drop feed from oil cups. The amount of oil fed depends upon the number and size of the oil drops.

(4) Oil soaked waste pressed against the journal. The amount of oil fed to the bearing depends upon the space available for waste.

(B) *Flood Lubrication*

I—*Without Pressure*

(1) Splash lubrication—Its effectiveness depends upon the rotative speed and the quantity of oil in circulation.

(2) Ring, collar and chain oilers—Their action depends chiefly upon the shaft speed.

(3) Oil lifted by a pump to a reservoir and fed to the bearing by gravity. Its effectiveness depends upon the oil quantity circulated.

II—*Pressure Feed Lubrication*—It depends not only on the oil pressure but also on the lubricant quantity circulated.

On the subject of oil grooves, there is a wide divergence of opinion among engineers.

The function of oil grooves is to distribute the lubricant and collect what would otherwise be forced out of the ends, and permit of returning it to a suitable point of the bearing surface for redistribution.

Unnecessary oil grooves are an actual detriment since they tend to break the oil film between the metal surfaces and to reduce the bearing surface.

THE Annual Convention of the National Machine Tool Builders' Association, held this week at Lenox, Mass., took three important actions governing the policy of the Association with respect to Exposition matters.

This convention brought together more responsible executives of machine tool building companies than any ever held heretofore, due to the great importance of the decision to be reached concerning the association's policy with respect to expositions. Every comment on the last Exposition was uniformly to the effect that it was the best ever put on for machine tool builders.

Satisfaction with the last show was reflected in the pledge, passed by almost unanimous vote, that during 1928, the companies represented would not exhibit machine tools in any exposition not conducted by this association. This pledge was re-affirmed several times by executives of large companies during the discussions leading to the two other actions taken.

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"Red Shield" HIGH SPEED DRILLS
ARE FOREMOST

Like a tower stands out distinctive and well remembered, the new "Red Shield" High Speed Drills, even with the short time they have been on the market, have won identical recognition.

Drill users who require high speed drilling with uniformity of performance, less breakage, and less grinding and at less cost per hole always remember that "Red Shield" Drills give such service.

The "Red Shield" in actual red color, is stamped on each Drill. ALL SIZES.

Manufactured by



STANDARD TOOL CO.

THE STANDARD TOOL CO.
New York Cleveland Chicago

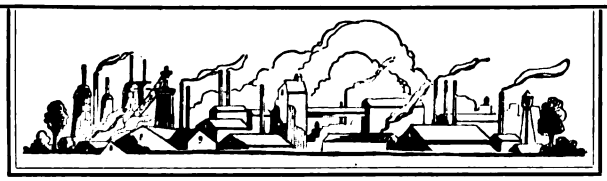
Oil Burner manufacturers find Allen Set Screws help them in making a durable mechanism to deliver an uninterrupted fool-proof service. ALLENS insure a maximum of "stay-put-ness" and a minimum of tampering with set-ups.



THE ALLEN MFG. COMPANY HARTFORD, CONN.

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The Trend Toward Simplified Practice

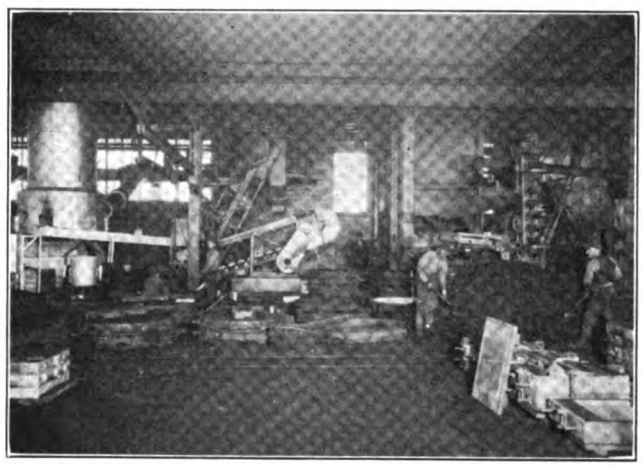
By E. J. Tournier

THE term "rationalization," whose equivalent in Germany is used to denote a concerted movement of the people in that country, does not have its exact counterpart in the United States. If, as it seems, this new Germanic trend is toward the single objective of increased national efficiency, it may be that there is in it something of interest for Americans.

A similar movement on the part of the whole American people is not probable in the present state of fusion of nationalities that is taking place here. In the various shops and factories all over the country, however, a definite plan is taking shape. This, too, has for its object the increasing of national efficiency through the acceleration of industrial processes. The effect of this speeding-up has been a remarkable increase in manufacturing efficiency running through the various industries of the United States since the close of the war. The volume of production in 1923 according to an analysis recently completed by the National Industrial Conference Board, New York, was 33 per cent. greater per wage earner than in 1914. The production required 25 per cent. less labor, 5 per cent. less power and 17 per cent. less management personnel per unit of production. It also required 7 per cent. less actually working time per man. The study made by the Conference Board has shown that the increased industrial efficiency has been due largely to the greater application of power, more extensive mechanization and increased managerial efficiency.

In the machine method of production which forms the base of our industrial structure, the responsibility for results lies with management rather than with labor. Executive thought has, therefore, been directed toward discovering means of counteracting ever-rising production costs, coupled with the demand for lower selling prices.

To that end a number of policies have been established for the purpose of simplifying manufacturing methods, shop practice and distribution. Most important of these policies is standardization, to which the United States Bureau of Standards lends generous support. Through the efforts of the Bureau and the co-operation of the various industries concerned, it has been possible to reduce the number of sizes of packing cases and crates to a fraction of the former numbers. Lumber has been classified in a similar manner and the same principle is now being applied even to making A. C. and D. C. motors interchangeable as to shaft sizes, speeds, bolt spacing, etc.



It is being recognized that mechanical means of handling foundry equipment such as flasks, molds, castings, as well as the mechanical preparation of molding sand, are the order of the day.

In pattern shops and foundries the same procedure is accepted as being in the line of progress. The standardization of color markings for patterns that has been carried out by the American Foundrymen's Association is a case in point. It is also being recognized that mechanical means of handling foundry equipment such as flasks, molds and castings as well as the mechanical preparation of molding sand are the order of the day.

The assembling of the latest practice in machine shops which is being undertaken by the Machine Shop Practice Division of the American Society of Mechanical Engineers, is still another example of the process of Standardization which is being carried out by practically every industry.

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The Prentiss

Speaking of vises—



. . . you'd go a long way before finding a vise so **well suited for shop work in every way as the Prentiss Vise.**

A Prentiss Vise offers many advantages—superior strength, a sure grip that never gives, adaptability to all types of work, many handy construction features such as the quickly adjustable swivel bottom, and the self-adjusting jaws, and a lasting durability that is a tremendous vise asset when it comes to good hard work.

These are a few of the reasons why Prentiss Vises are standard equipment in so many of the largest shops.

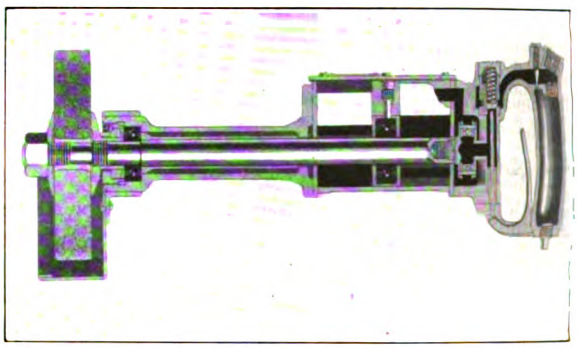
PRENTISS VISES
PRENTISS
106-110 LAFAYETTE ST. NEW YORK CITY
VISE CO.
CHENEY HAMM

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High Production Pneumatic Grinder

THIS machine operates under load of 5400 r.p.m., giving 8500 surface feet per minute as recommended for this type of wheel and endorsed by the Safety Code. The free speed without load is controlled by a quick acting governor which cuts off the air at 5800 r.p.m. It is claimed that ample power has been provided to maintain the speed of 5400 r.p.m. under load, and that the construction of the motor makes it possible to operate continuously at this high speed with exceptionally low maintenance cost.

The two rotors shown in the accompanying phantom do not touch the cylinder, operating in a film of oil. The spindle runs in ball bearings. The exhaust and inlet sides are sealed by the fibre blade riding on the chrome nickel steel rotor. This construction concentrates wear on the fibre blade, which can be replaced in five minutes at very little cost.



It is claimed that the new model with certain rubber bonded wheels gives an increase in cutting ability of 30 to 50% on cast iron and 35 to 55% on steel.

The machine was demonstrated at the National Steel and Machine Tool Exposition, Convention Hall, Detroit, September 19th to 23rd.

Range Boilers Economically Welded by Electric Arc

THE automatic carbon arc welder for range boilers was brought out to meet the particular needs of the producers of range boilers on account of the sharply competitive conditions in this field. While large numbers of range boilers are produced, the price the manufacturer gets for the boilers is very close to his actual cost. Use of high speed automatic machinery under such conditions by the dominating factors in the industry usually solves the problem.

On 14 gauge steel the automatic carbon arc welder makes a speed of 150 feet per hour at a cost of slightly over 1¢ per foot of longitudinal seam. The cost per foot on the head seams is somewhat less than on the side seams. The side seam is welded with a filler rod, which is laid on the seam and fused into the joint by the carbon arc. The range boiler is slipped on to the mandrel of the machine and the top clamps lowered to hold the seam in position. Water cooled copper guards confine the arc to the seam. The clamps also carry the upper rail on which is mounted the carriage for the automatic welding head. The operator merely starts the arc in operation and the motor driven head is carried along

(*Continued on page 60*)

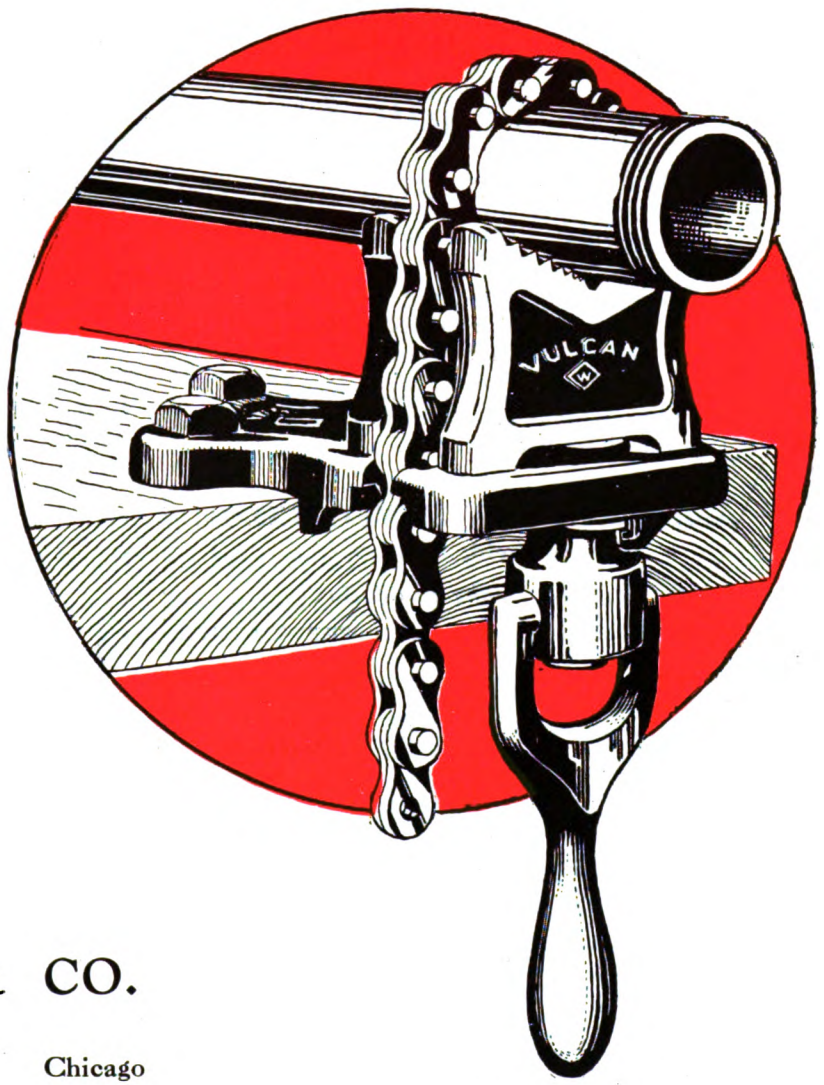
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Small In Size— Great Otherwise

Williams' reputation for quality tools is exemplified in the *Genuine* Williams' VULCAN Vise.

The "Vulcan" features,—entire wrought-steel construction —light; unbreakable; drop-forged jaws, base and handle; positive grip, instantly locked or released by a turn of the handle, make instant appeal to the skilled worker.

A large percentage of the delays in industry today can be charged directly to poor or inadequate tools. Wherever a pipe must be held, the Genuine Williams' VULCAN Vise is the last word in efficiency. See your supply house or write us.



Four sizes for 1/8" to 8" pipe

J. H. WILLIAMS & CO.

"The Drop-Forging People"

New York BUFFALO Chicago

Trade Mark

GENUINE WILLIAMS

SUPERIOR DROP-FORGED TOOLS

"VULCAN" DROP-FORGED CHAIN PIPE VISE

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Screw "LENOX" Drivers



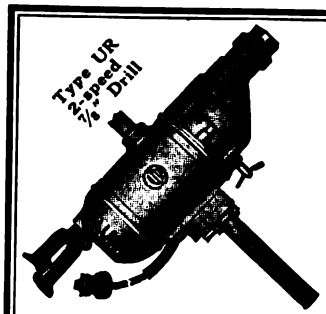
Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

Points are heat treated to stand the strain without bending. And the handles cannot loosen.

Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

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Springfield, Mass.
"The Tools in the Plaid Box"



The *Real* Solution Is the 2-SPEED DRILL

At last, the two-speed drill is coming into its own! Production men realize that the single speed portable drill is too slow when used with twist drills smaller than its maximum capacity. They insist on the two-speed for the proper drilling speed on large *and* small twist drills.

The Cincinnati
TWO-SPEED DRILLS

are available in ½" and ⅞" capacities. They keep efficiency high and costs at rock bottom.

"The ALL-PURPOSE Drills" described fully in Bulletin No. 122. Write for it . . . today

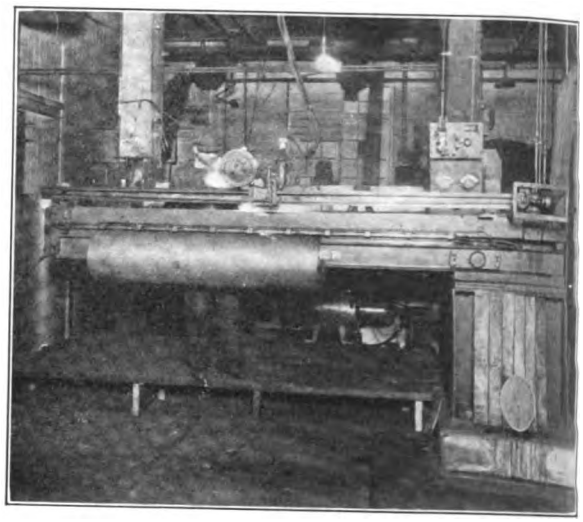
PORTABLE DRILLS DRILL STANDS
BENCH AND FLOOR GRINDERS
TOOL-POST GRINDERS
HAND AND AERIAL GRINDERS

The Cincinnati Electrical Tool Co.
2685 Madison Rd. CINCINNATI, OHIO
"A complete line of Portable Electrical Tools for Every Purpose"

(*Continued from page* 58)

the seam, fusing the filler and the edges of the seam together.

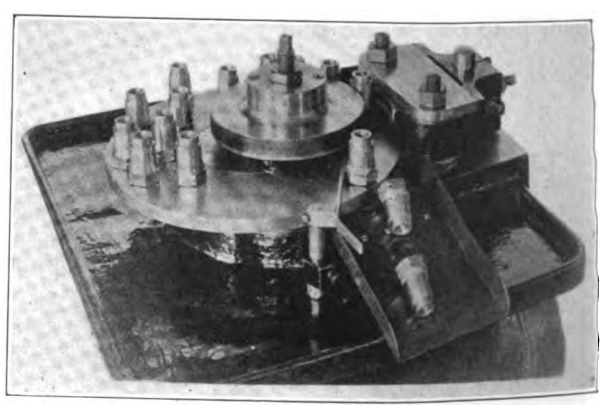
While the above described equipment is built primarily



for the completely welded range boiler, it is also adapted to the welding of the riveted and welded range boilers. In this type of construction the rivets are spaced rather widely and the weld is applied to the lap for pressure tightness.

Rapid Production Machine for Marking Small Parts

THE latest type of rapid production marking machine was designed for marking such parts as spark plugs, screw machine parts of various kinds, round bushings, and similar articles with a sufficient body to be marked without being crushed. The illustration shows spark plugs being marked on the round surface.



The working parts of this machine consist of the central dial which rotates at a speed of about 40 revolutions per minute and carries the work across the lettering die to produce the desired mark. A loading table which carries the work forward to the marking position revolves much slower than the pressure dial, giving ample time for the operator to load it. The work is placed in any convenient place on the carrying dial, which dial automatically brings the parts into position as it revolves and after being marked the parts are unloaded by a simple fixture, which carries them down the chute into a receptacle.

The driving parts consist of a worm and gear fitted

(*Continued on page* 62)

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THE STANDARD OF QUALITY
1897 - 1927

FOR continuous production service, low maintenance cost and long life, U.S. Grinders have made some notable records. These are only natural when you consider these grinders point by point:

Powerful motors with 40 degree centigrade ratings have 100 percent momentary overload capacity. Heavy duty SKF Ball Bearings (in dust-tight boxes) support the heavy one-piece nickel steel spindle. The whole machines are built ruggedly to run smoothly at any speed.

Many other features will easily convince you that you cannot make a better choice. Get all the facts from your jobber, or write us.



U.S.
12", 14", 16", 18", 20"
Ball Bearing Grinders
Alternating and Direct Current

Furnished regularly for 110, 220, 440, 550 volts, 1, 2 or 3-phase, 25, 40, 50 and 60 cycle alternating current; 110 and 220 volts direct current.

THE UNITED STATES ELECTRICAL TOOL COMPANY
Oldest Builders of Electric Drills and Grinders in the world
2476 WEST SIXTH STREET, CINCINNATI, OHIO, U.S.A.

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Listing 2300 Tools

Designed to Keep Down Production Costs



There are 2300 tools listed in Brown & Sharpe Small Tool Catalog No. 30.

Every one of these tools is designed and built for accuracy and long life.

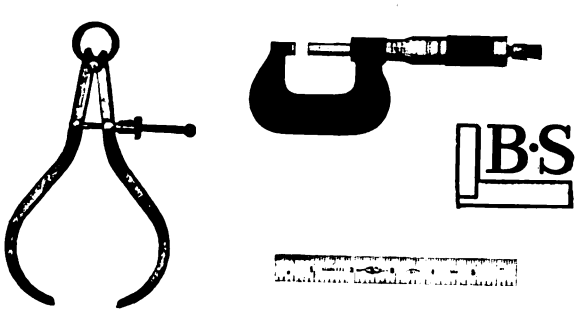
Their performance in your factory will help you keep down production costs.

You can probably get a copy of Catalog No. 30 from your hardware dealer. If not, we shall send you one free on request.

Dept. I. I.

BROWN & SHARPE MFG. CO.

Providence, R. I., U. S. A.



BROWN & SHARPE TOOLS

"World's Standard of Accuracy"

For products not adverti

(*Continued from age* 60)

with a ball thrust bearing and run continually in oil. The essential moving parts are made of steel, heat treated and ground.

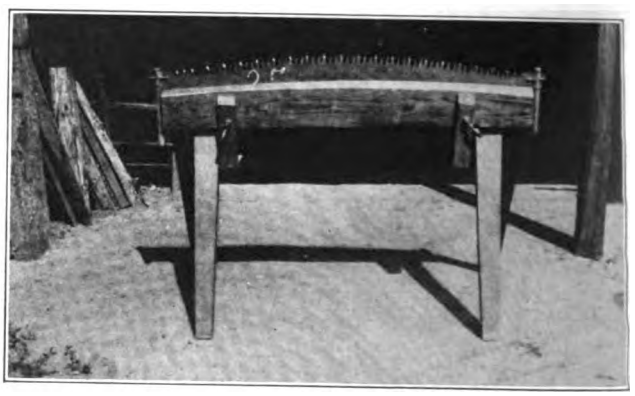
The lettering die is mounted in a substantial die holder, which can be raised and lowered to a considerable distance in order to secure the mark on the proper place on the work. The pressure dial can also be raised and lowered to correspond with the die. With this arrangement different sizes and different positions on the same size piece can be marked by simply changing the position of the die holder, pressure holder, or lettering die.

This machine is capable of marking 125 pieces per minute. It is driven by a ¼ horsepower motor, which is part of the equipment of the machine. The machine stands on a pedestal and is self-contained. It weighs 425 pounds.

Handy Saw Filing Clamp

By L. M. Jordan

THE accompanying illustration shows a very handy clamp for holding cross-cut saws for filing, swaging, setting the teeth, etc., that is portable and has unusual advantages.



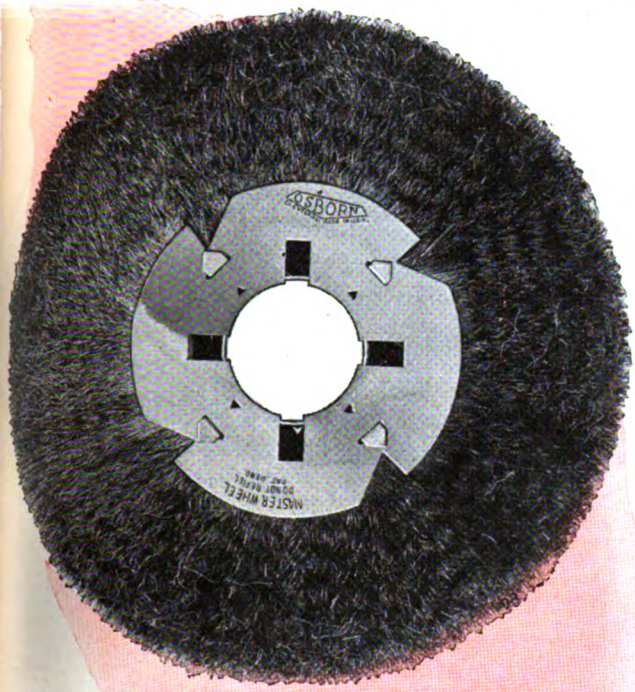
The device resembles the ordinary carpenter's sawhorse in general appearance or form. The differences are that the horizontal connecting member at the top of the legs is made of two pieces of 1 by 6-inch lumber and two of the legs are attached to this horizontal portion by hinges. The two horizontal boards are one-inch shorter than the saw blades to be worked and both have the outer corner of their top edges bevelled to prevent the filer's hand or file striking these corners when filing the cutting teeth. These upper edges are also curved to a degree that when a saw blade is placed betwen them the gums of the teeth are almost flush with the edges throughout the length of the blade. Four cleats, made of 1 by 2 inch hardwood, are nailed in a vertical position, two on the outside of each clamp board, and one about 10 inches from either end of the board as shown in the illustration. These cleats are 10 inches long and their lower ends extend 6 inches below the lower edges of the boards and each pair of cleats are attached exactly opposite each other. Small blocks of wood 2 inches thick are nailed between the lower ends of each pair of cleats. The upper ends of these cleats are also bevelled outward allow more space for the filer. A half-inch diameter bored through each pair of cleats near the lower the clamp boards and through the boards also.

(*Continued on page* 66)

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OSBORN

Osborn Master Wheels Save Money

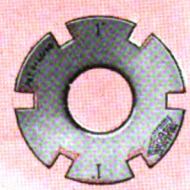


Osborn Master Wheels eliminate the use of expensive hubs and materially reduce the time for changing wheels. With inexpensive Osborn Adapters, which snap easily into the standard 2″ openings, Master Wheels can be simply fitted to any size arbor.

For buffing, cleaning and polishing, Master Wheels are efficient and long wearing. They are made of specially drawn and tempered steel wire. The sections are assembled on a light hub under tremendous pressure and are guaranteed to stay together during the entire useful life of the wheel.

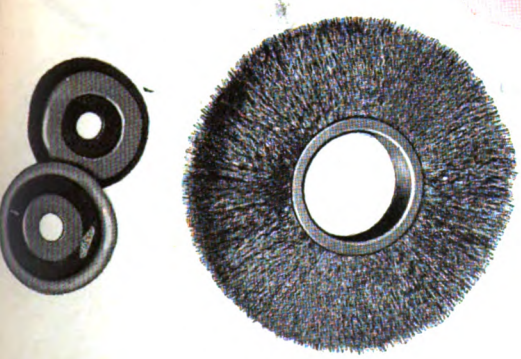
If you are not already using Osborn Master Wheels you will find it worth while to investigate their economies.

This type of Osborn Master Wheel is made in diameters ranging from 8″ to 15″—all with standard 2″ opening. Adjustment to fit any size arbor is provided by the use of Osborn Adapters. Careful inspection insures that every wheel is properly balanced and perfectly circular.



THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Ave. Cleveland, Ohio

Branch Offices
New York Detroit Chicago
San Francisco Los Angeles



Osborn Master Wheels in 4″ and 6″ sizes were developed particularly for use with portable drills and flexible shaft equipment. Adapters which slip into the 2″ center opening provide for any shaft size desired.

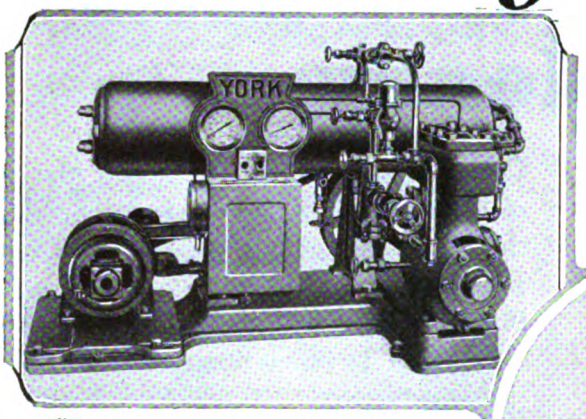


Osborn Brushes

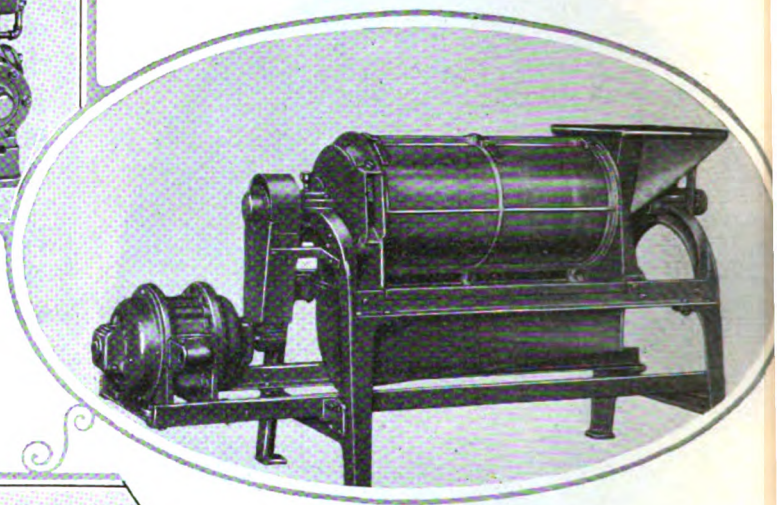
BETTER WEARING BRUSH FOR EVERY USE

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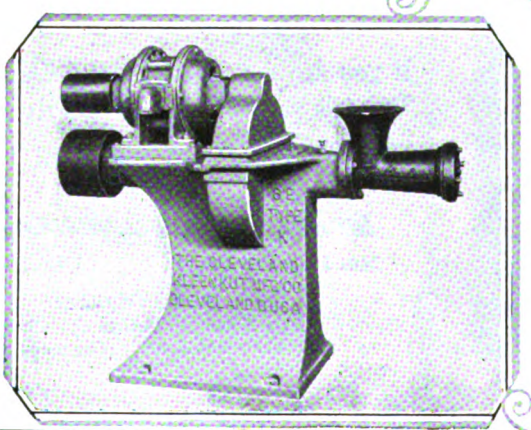
The High-Torque



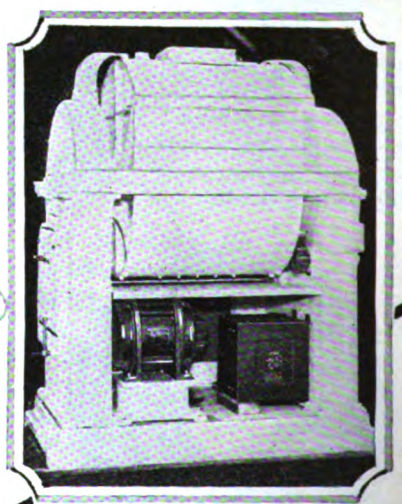
"FTR" driving York Refrigerating Machine



"FTR" driving Indiana Pulper



"FTR" driving Cleveland Kleen Kut Meat Chopper



"FTR" driving Allison-Century Dough Mixer

Apply the proper G-E motor and the correct G-E controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. Built in or otherwise connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.

GE Motorized Power
-fitted to every need

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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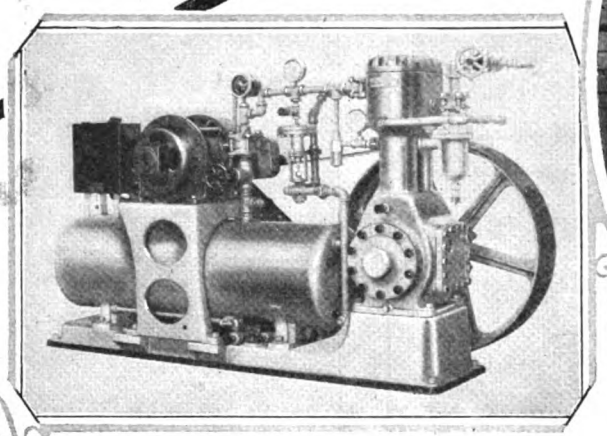
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Polyphase Motor— TYPE FTR

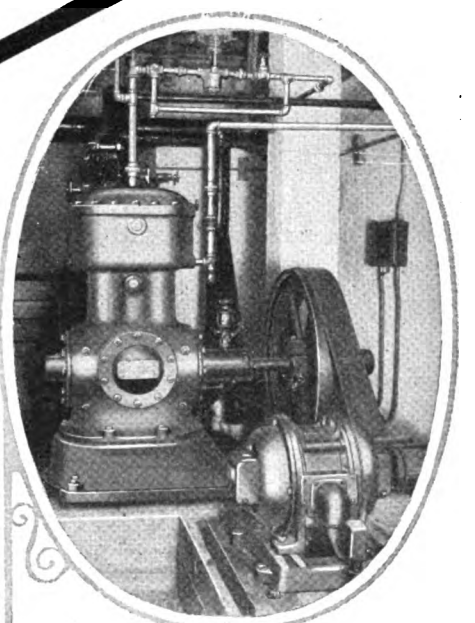
The following indorsement is typical of customers' satisfaction with "FTR" polyphase motors:

"We are especially well pleased with Type 'FTR' Motors for two reasons. First, we are able to throw these Motors directly across the line. Second, we like the high starting torque of these Motors which eliminates the friction clutches we otherwise would have to purchase for our heavy conveyors."

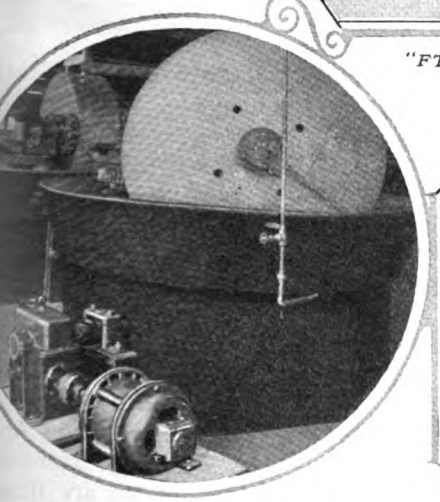
Preference for the "FTR" and confidence in its operation are illustrated here in a variety of representative applications.



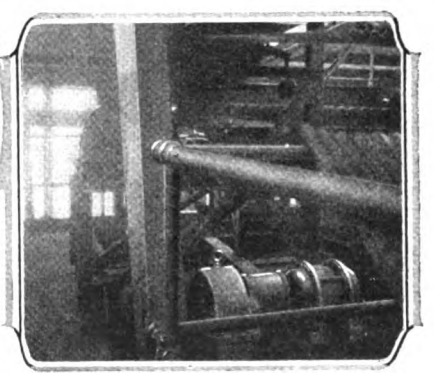
"FTR" driving Lipman Refrigerating Machine



"FTR" driving Frick Refrigerating Machine



" driving National Equipment Co. 7-ft. Chaser



"FTR" driving Link Belt Conveyor

201-93

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TENTACULAR
TRANSMISSION BELT

will solve for you the problem of perfect power transmission on your machine tools and other machinery.

Ideal for short centers and high pulley ratios.

No special pulleys required. Idlers eliminated.

SIMPLE - ECONOMICAL - EFFICIENT

Patented all over the world

ALEXANDER BROTHERS, Inc.

Makers and Sole Licensers for U. S. and Canada

18 South Street, Philadelphia, Pa.

Parks shipping room saw *at a lower price!*

was $75.00
NOW $60.00
without motor



Cut your crating pay-roll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big work; little price — that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

FILL OUT AND MAIL THIS COUPON—NOW!

L. L.
The Parks Wood-Working Machine Co., 1600 Knowlton Street, Cincinnati, Ohio.

You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ ..... men making crates.

Name .....
Firm Name .....
Address .....
City..... *State*.....

The Parks Woodworking Machine Co., 1600 Knowlton St., Cincinnati, Ohio

Canadian Factory: 208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

(*Continued from page 62*)

and bolts of this size are inserted through these holes with levered nuts on the opposite side that may be manipulated without the aid of a wrench.

The saw blades are inserted between these two clamp boards in an inverted position as shown in the illustration, with the handles attached. The boards are then clamped tightly against the blade by drawing up the nuts on the bolts, and the blade is thus held steadily throughout its entire length at the same time.

A "Tea-Wagon" Work-Bench

WHERE a work-table, to be of most service, must be moved about from one location to another, a mounting of the table on adjustable wheels, as shown in the illustration, may have distinct advantages. This table, a "home-made" affair, at the plant of a piano builder has been dubbed by the workmen the "tea-wagon."



The axle is mounted eccentrically in such a way that by throwing the lever (made from a piece of pipe) from one peg, through an arc of 180 degrees, to the other peg the wheels come up off the floor and leave the table on a rigid four-legged foundation.

The shelves underneath provide storage space for parts or material being worked on. To facilitate access to the upper of these two shelves the top is hinged along one of its long edges.

Three Types of Flexible Shaft Tools

SUPPLEMENTING the article, "Cost-Cutting Applications of Small Tools" by Reginald Gordon, which appeared in our September issue, here are three forms in which flexible shaft tools are manufactured to suit varying shop conditions.

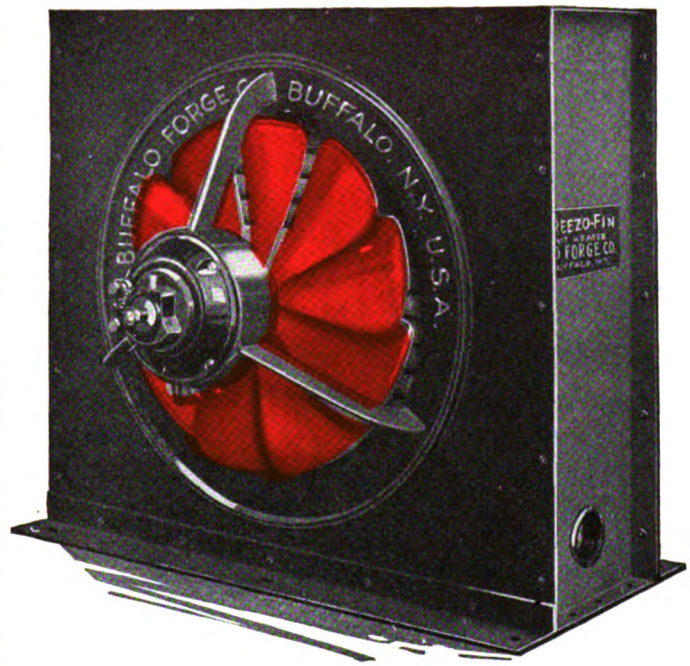
The most commonly used of flexible shaft equipment is one that has multiple speeds. This is known as the Countershaft Type, with the countershaft mounted on top of the motor. By shifting the belt you obtain different speeds. Also, by transposing the pulleys you get

(*Continued on page 68*)

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Ample heat for 180,000 cu. ft. of uninsulated factory space with 6 Buffalo Breezo-Fin Units

The Radio Cabinet Company, Indianapolis, use Buffalo Breezo-Fin Heaters in their new factory. Here's what President C. A. James says about them:



"OUR 18,000 sq. ft. building where Orchestrion loud speakers and radio cabinets are finished and packed, is heated with 6 Buffalo Breezo-Fin Unit Heaters, installed on the recommendations of other users when the building was erected in 1926.

"This is not an easy building to heat, being of frame construction and uninsulated. The heaters must maintain a temperature of 65° to 70° in 180,000 cu. ft. of space, although large doors are frequently open on the shipping floor, and the exhaust fans in the spraying booths on the finishing floor remove an enormous quantity of air.

"Nevertheless, a comfortable temperature was maintained last winter without difficulty and with small fuel consumption. In the severest sub-zero weather, a flow of steam was kept in the heaters 24 hours a day, and the fans were turned on and off as comfort demanded. Under ordinary conditions, the heaters are in operation only part of the time.

"The Breezo-Fins have given no mechanical trouble, and require only occasional oiling. The heaters are mounted on the walls, where they occupy no valuable space."

Buffalo Forge Company

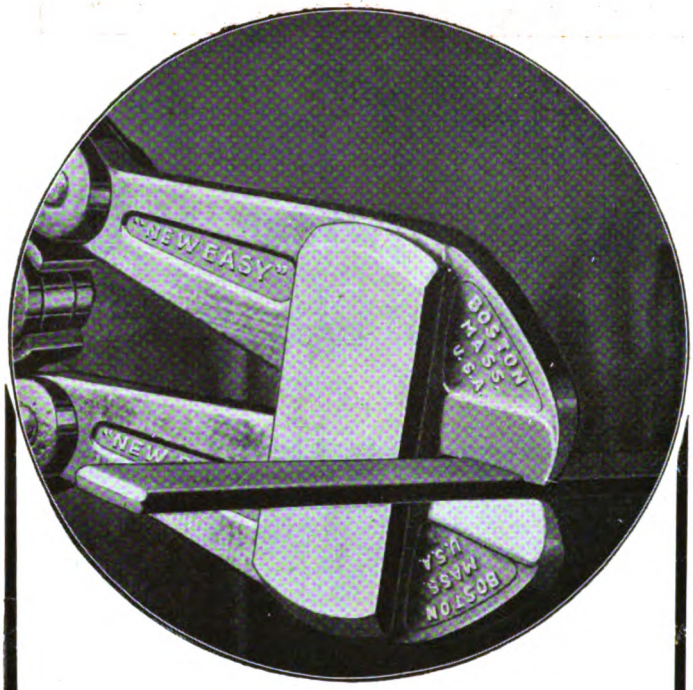
440 Broadway **Buffalo, N. Y.**

In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ontario

"Buffalo" **Unit Heaters**

FOUR TYPES — FOR EVERY SHOP

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Cutting Flat Stock

WITH A PORTER BOLT CLIPPER

Just one of the many jobs which a Porter Time Saver will do without strain and with little effort and in a fraction of time required with that of a hacksaw or chisel. These powerful tools save time-save the man. Will cut up to 3/4" annealed bolts in the thread.



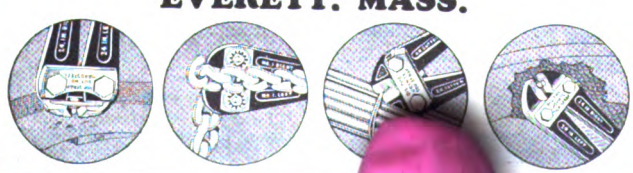
Time Savers
PORTER'S BOLT CLIPPERS

are cutting tools developing great power through leverage and a form of toggle joint. They multiply man-power about 70 times. Made in a number of styles for cutting bolts and rods, splitting nuts, cutting chains, etc. Moderate in cost and essential tool equipment for bench, shop, or kit.

Sold by Jobbers and Supply houses everywhere

Ask your dealer or write to us for booklet

H. K. PORTER, INC.
EVERETT. MASS.



(*Continued from page 66*)

additional speeds, making this particular type of machine suitable for work that requires a multitude of speeds. For instance, when grinding with an emery wheel it is necessary that the proper peripheral speeds be obtained so that the wheel will function properly, and for this reason you require a high speed. If this machine is to be used for scratch brush work where a wire brush is



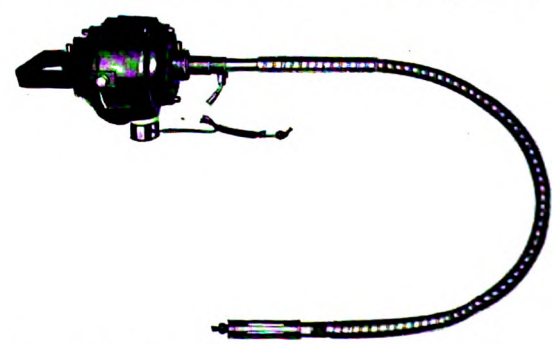
used, a lower speed is necessary due to the fact that a wire brush will not stand a very high speed. Where this machine is used for different classes of work, and different sizes of wheels and attachments, we recommend the multi-speed countershaft drive as the best all around shop tool for average work.

The second type of machine is known as the Direct Drive. This machine has only one speed, namely that of the motor which usually is 1750 or 3500 r.p.m. In this case the flexible shaft is connected directly to the armature



shaft. There is no belt, countershaft or pulley, and for certain classes of work where one speed is suitable this machine makes an ideal unit for continuous production service providing the speed is sufficient for the particular work it is intended for.

The third type of equipment is known as the Direct Drive Ceiling Suspended Unit. This equipment is suit-



able for work where a single speed can be utilized, and where the work is of such nature that a machine sus-

(*Continued on page 70*)

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BLACK & DECKER

PORTABLE ELECTRIC TOOLS



Illustration above shows two Black & Decker No. 3 Reversible Electric Socket Wrenches being used at The Yellow Sleeve Valve Engine Works in fitting main bearings on the engine asembling line.

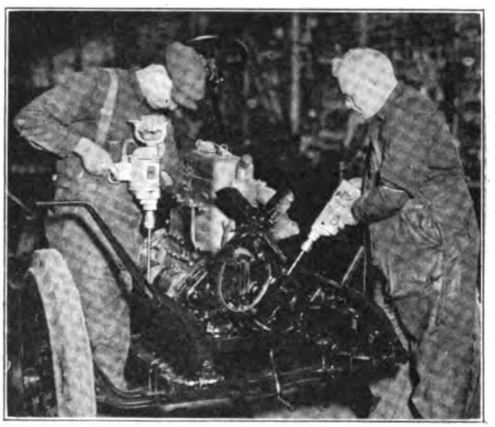
Now—Necessities in Production—

The economy and efficiency of the portable electric drill is now apparent on dozens of jobs in every industry. It has become a real production tool.

Black & Decker Portable Electric Drills, Socket Wrenches, Tappers, Grinders and Screw Drivers now speed production in virtually every industry, saving time and labor and bringing costs down to lower levels.

In addition to production, you can put Black & Decker Portable Electric Tools to work on building maintenance and repair work around your plant.

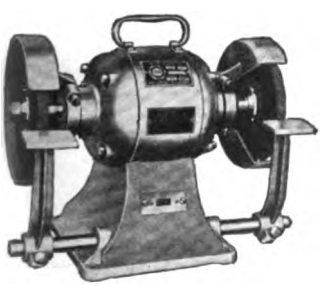
Ask your dealer to show you the various sizes and types and their applications.



Black & Decker Portable Electric Drills being used for asembly work at the Brockway Motor Truck Corp.

Portable Electric Tools

"With the Pistol Grip & Trigger Switch"



6 inch ¼ horsepower Black & Decker Electric Bench Grinder

THE BLACK & DECKER MFG. CO.

TOWSON, MD., U. S. A.

Black & Decker Mfg. Co., Limited, Toronto, Ontario Black & Decker, Limited, London, England

Branch Offices and Service Stations in:

Boston, Buffalo, New York, Philadelphia, Oakland, Cal., St. Louis, Atlanta, Dallas, Detroit, Chicago, Baltimore, Minneapolis, Kansas City, Cleveland, Los Angeles, Seattle

Products:

Electric Grinders, Electric Valve Refacers, Electric Tappers, Portable Electric Drills, Electrical Screw Drivers, Electric Socket Wrenches

You can purchase Black & Decker Products from the leading Supply Houses

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La Salle Grinders

For Precision and Production



No. 1 Plain and Surface Grinder

(Micrometer Adjustment)

Grinding wheels .....8"x1"
Between wheels .....15"
Height to spindle center .40"
Table surface .....8"x14"

Has vertical travel of 12" on guides, ¾" by micrometer, and may be raised to within 2" of spindle center. Wheel grinds to center of a surface 9" wide.

Spindle speed....2450 r.p.m.
Countershaft speed .800 r.p.m.
Floor space .....18"x24"
Net weight .....300 lbs.

PRICE $115.00

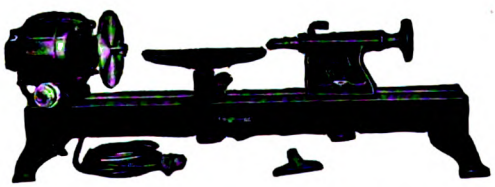
La Salle No. 1 is equipped with every attachment to promote simplicity and speed in operation. The horizontal hand wheel carries a dial graduated to 1000ths of an inch, and as the divisions are 5/32nds of an inch apart, finer adjustments are easily obtainable. The knee may be brought to any position by means of the vertical hand wheel. Reamed bearings assure perfect alignment. Within its capacity no tool is more generally useful in tool room or shop. *Its use insures precision.*

ALSO MANUFACTURERS OF

No. 2 Automatic Surface Grinder
No. 3 Surface Grinder
American Twist Drill Grinders, also
Electric Motor Spindle Grinders.

Prices on application

LA SALLE TOOL COMPANY
OTTAWA, ILLINOIS, U. S. A.
La Salle County Formerly of La Salle, Illinois



This Portable Lathe Does Fine Work and Cuts Costs

FOR fine lathe jobs in woodworking, the H & A Portable Electric Bench Wood Lathe can be used conveniently and economically.

While performing excellent work, this machine saves time and labor and cuts production costs. Sturdily built as a self-contained unit, this lathe can be moved quickly from job to job.

Other portable electric bench machines in the H & A line, all of which reduce production costs, are the band saw, the rip saw, the swing saw and the jointer.

Send for descriptive literature on the H & A line which is sold through dealers.

HESTON & ANDERSON
613 W. Depot Ave. Fairfield, Iowa

Portable Electric — H&A — Woodworking Machines — Bench Machines

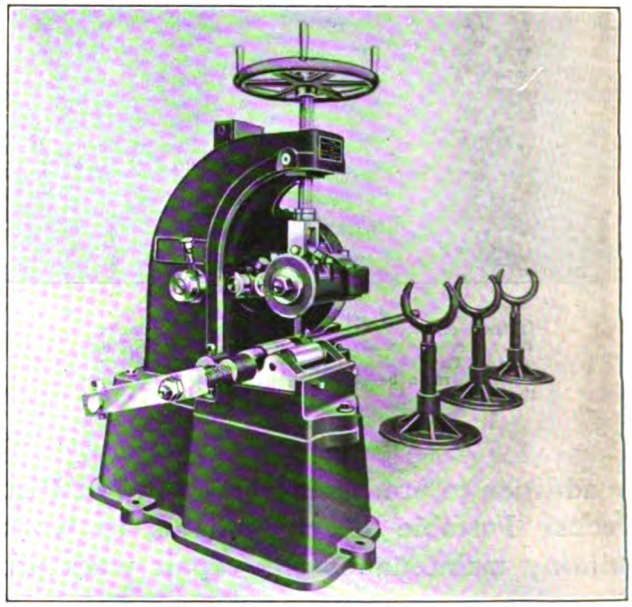
(Continued from page 68)

pended from the ceiling will work to advantage. These ceiling suspended outfits are sometimes mounted on rails so that they have a travel movement to cover larger areas of working surface. These machines, of course, are designed for only one speed, namely the speed of the motor, which is either 1750 or 3500.

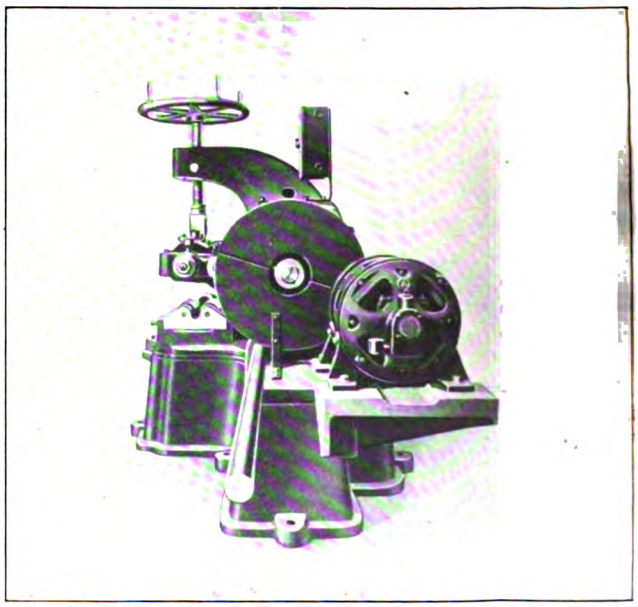
These three types of equipment are furnished in various power sizes, from ⅛ hp. to 1 hp..

Heavy Duty Roller Pipe Cutter in New Sizes

FOUR-INCH and six-inch sizes of pipe cutting machines of the roller type have been made available by one manufacturer. The four-inch machine has a range from 1½" to 4" pipe, but by adding a small cage



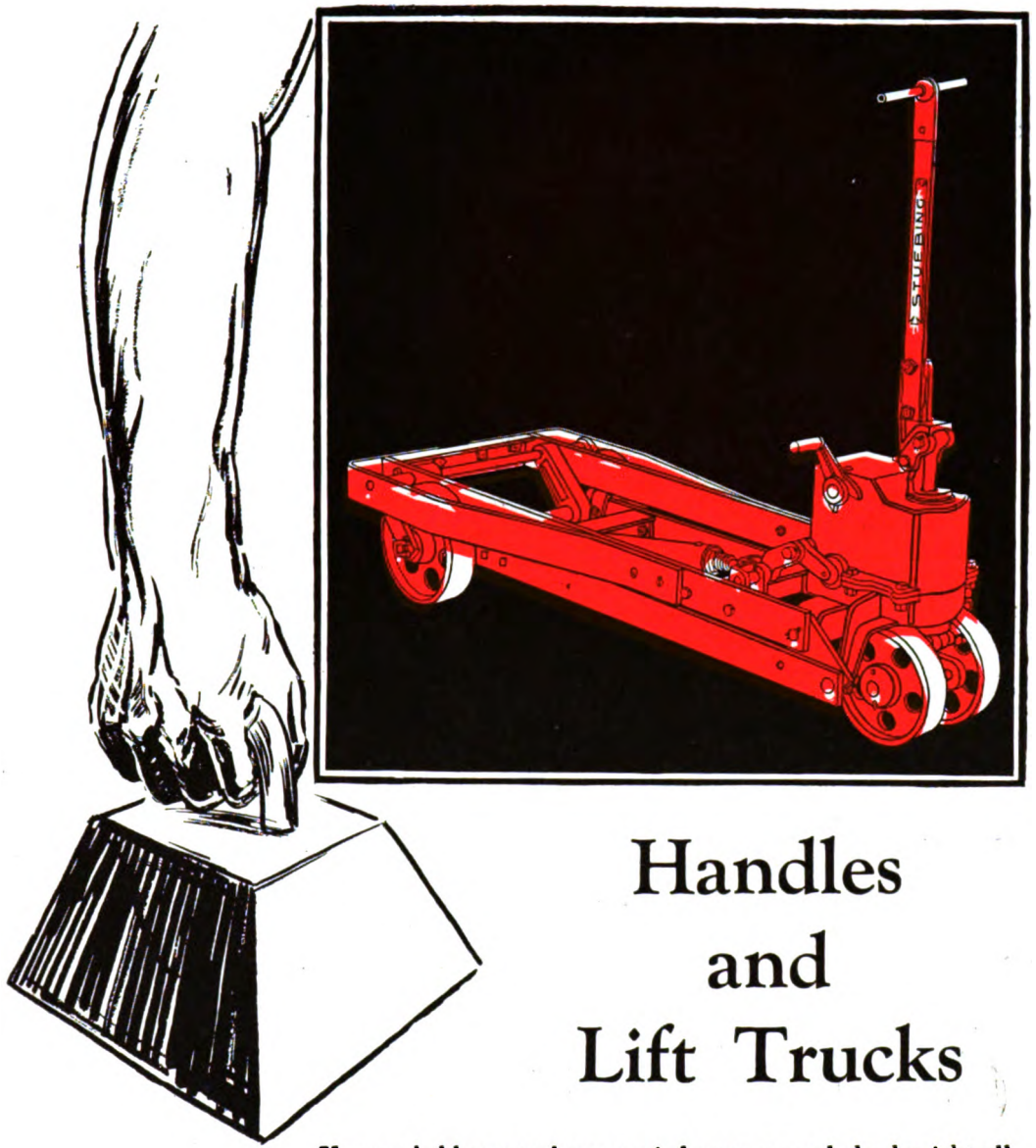
Front and rear views of six inch heavy duty pipe cutter.



of rollers, it can be used for cutting off pipe from ½" to 4". The standard range of the six-inch machine is from 3½" to 6" inclusive. By the addition of the small

(Continued on page 72)

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Handles and Lift Trucks

You probably never have carried a ten pound deadweight all day long—but you can imagine how fatiguing it would be—how it would slow you up. Don't think that carrying heavy truck handles does not fatigue your truckmen and cost you money. That is why on the later models of Stuebing-Cowan trucks with the exception the Blue Streak and the G and D models, the handles are balanced.

But, providing featherweight handles is only one refinement in handles alone that Stuebing has made. Stuebing handles cannot fly back. Stuebing handles do not trip men. Stuebing handles do not whip sideways. Down to the last possible detail, Stuebing-Cowan products are perfectly designed and engineered. That's why as units they wear longer—serve better—cost less. Delco—American Can—big and little corporations everywhere recognize this. They re-order again and again.

Write for our K Model Bulletin. It is interesting.



Stuebing Steel Bound — Patent Bound — Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble.

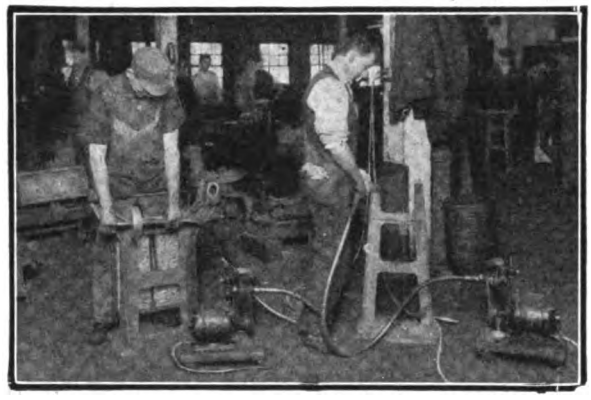
The Stuebing-Cowan Co.

Cincinnati, Ohio Holyoke, Mass.

StueBing COWAN

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General Casting Grinding With H-6 Equipment

Haskins H-6, Improved Four Speed Timken Bearing Countershaft Equipments represent the latest development in cost cutting flexible shaft equipment for medium size and heavy casting grinding. Speeds—826, 1,225, 2,400 and 3,400 R.P.M. ½" x 6' Flexible shaft. No. 6 Ball-bearing Spindle. Powered from the nearest light socket. Handles grinding wheels up to 6" x ¾". Easily moved from job to job.

Ask about the New, Improved H-7 1 H.P. Floor Truck Type.

Ask Your Jobber or Write for Complete, New Catalog

R. G. HASKINS CO.

Portable Flexible Shaft Machinery

4640 Fulton Street **Chicago, Illinois**

Branch Offices in Principal Cities

The GAMMONS helical



taper pin REAMER

Saves Time, Energy and Money

Reams ten times as many holes and reams them three times as fast as a straight fluted taper pin reamer can.

It is designed for use in power driven machines—drill press, electric or air drill. It can be used in any device that will rotate it. To get the best results it should revolve about three fourths as fast as a twist drill of like size is usually run.

Write for illustrated booklet.

The Gammons-Holman Co.

405 Main Street **Manchester**

(Continued from page 70)

cage of rollers this machine will cut off pipe from 1" to 6".

The cutter is made from tool steel and heat treated to give the maximum wearing qualities. It can be reground when dull. The cutter shaft bearing is provided with an adjustable cap on the cutter side for taking up any wear which may occur. This adds greatly to the life of the machine. The cutter is lowered to the pipe by means of a hand wheel located at the top of the machine.

The rollers are made from tempered tool steel and are carried in roller bearings. The cage which supports them is bolted to the bed of the machine.

The length gauge is adjustable for the different sizes and lengths of pipe. It will gauge lengths of pipe up to and including 40". The parts coming in contact with the revolving pipe are hardened to resist wear. The gauge arm is a heavy forging and will resist flexure.

The machine is powerful in construction and rigid in design. All spindles and shafts are ground and run in bronze bushed bearings. The gears are enclosed, but are accessible at all times.

The first illustration shows the belt driven machine while the second shows the machine arranged for and equipped with motor.

A 3-hp. motor is required for the four-inch machine, while a 5-hp. motor is required for the six-inch machine. When motor driven, the power is transmitted from the motor to the machine by means of gears.

Where Helical Cutters Increased Production

ONE firm of manufacturers, in meeting the demand for increased production which arises in many parts of the plant, has found it advantageous to use helical milling cutters, in place of the regular milling cutters formerly used on many jobs. The use of these cutters not only increased production but in many instances it was found that their performance was such that entire operations could be eliminated or that one machine could turn out the same amount of work formerly handled by two machines. This elimination of intermediate operations or the freeing of machinery so that it could handle other work caused a substantial decrease in the overhead expense as well as a decided increase in production.

One good example of the great saving effected by the use of helical mills occurred in the milling of form tool blanks. These blanks are made of tool steel and with the helical mills twice as many were finished per hour as were formerly finished with the regular milling cutters—a clear gain of 100%. A machine formerly turned out 100 pieces per hour, which rate was jumped up to 200 pieces per hour and the cutter was removing the metal at the rate of 3¼ cu. in. per minute.

Another instance of the saving effected by the use of helical mills was found in the milling of table gibs. These parts were formerly rough milled and then planed down to size because a very smooth finish was necessary. With the helical mills it was found that the size of the cut could be increased, obtaining at the same time the desired finish—thus eliminating the long and rather expensive operation of planing. There was a substantial decrease in the cost per piece of these parts as well as a decided increase in their production.

(Continued on page 74)

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FAMOUS SEXTETTES



The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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We Originate and Build

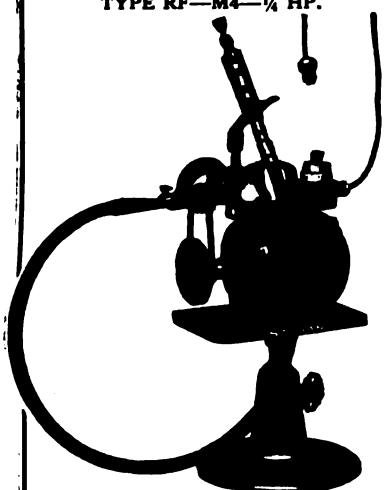
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Twenty-two Years In This Industry

ESTABLISHED 1905

A NEW DEVELOPMENT

TYPE RF—M4—¼ HP.



Here is a machine that will be appreciated by every mechanic who has anything to do with the finishing of dies or similar work—

ROTARY FILING GRINDING AND POLISHING

Simply attach to your lighting circuit.



This Equipment Consists of

8 assorted shapes, high speed steel, hand cut files, ball bearing hand piece, 9 assorted grinding wheels, 3 wheel spindles for same, 3x1 rubber polishing drum, three speed countershaft, flexible shaft 5 ft. long, ¼ HP. motor, mounted on adjustable swivel stand, wrenches, cord, switch and plug.

We Build Machines from 1/10 HP. to 2 HP. Send for Catalog

Manufactured by

N. A. STRAND & CO.

5001 No. Lincoln St. Chicago



ARMSTRONG BROS.

QUALITY PIPE TOOLS

Experienced tool users want real satisfaction and lasting service. ARMSTRONG BROS. Pipe Tools give both to the fullest measure. They are made from Highest Quality Materials, are of Superior Design and of Excellent Workmanship.

Write for your copy of Catalog B-27, just out, which shows the complete line of ARMSTRONG Tool Holders, Lathe Dogs, Clamps, D. F. Wrenches and Pipe Tools, with descriptions, sizes and prices.

ARMSTRONG BROS. TOOL CO.

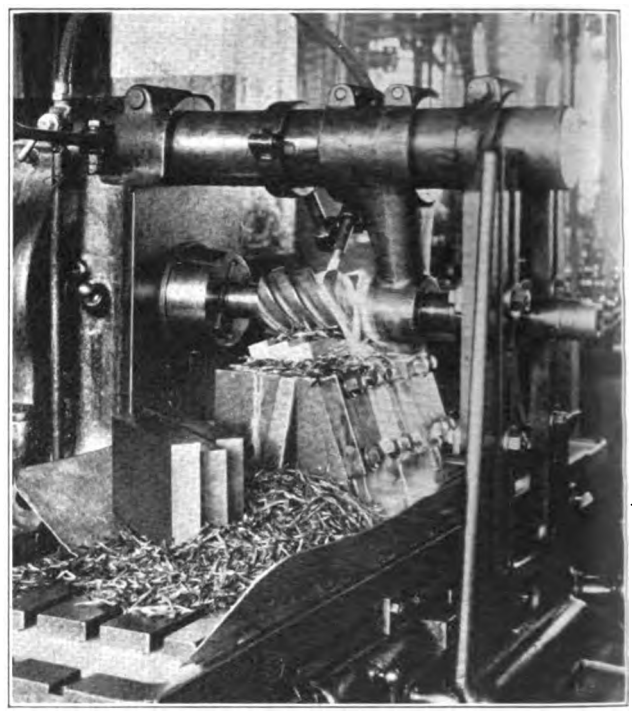
"The Tool Holder People"

318 N. Francisco Avenue

CHICAGO [illegible] A.

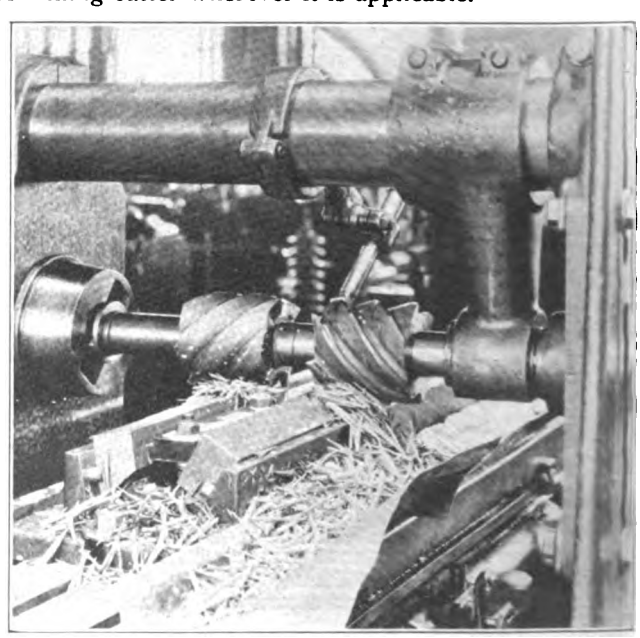
(Continued from page 72)

In milling some other machine parts a saving of 3½ minutes per piece occurred as the milling time was actually reduced from 4 minutes to half a minute. In this instance the parts were made of soft machinery steel and the cut was a light one. However, the use of the helical mills, in place of the regular cutter, was the only reason for the tremendous increase in production as the "slicing" action of the helical mills made higher spindle and surface speeds possible.



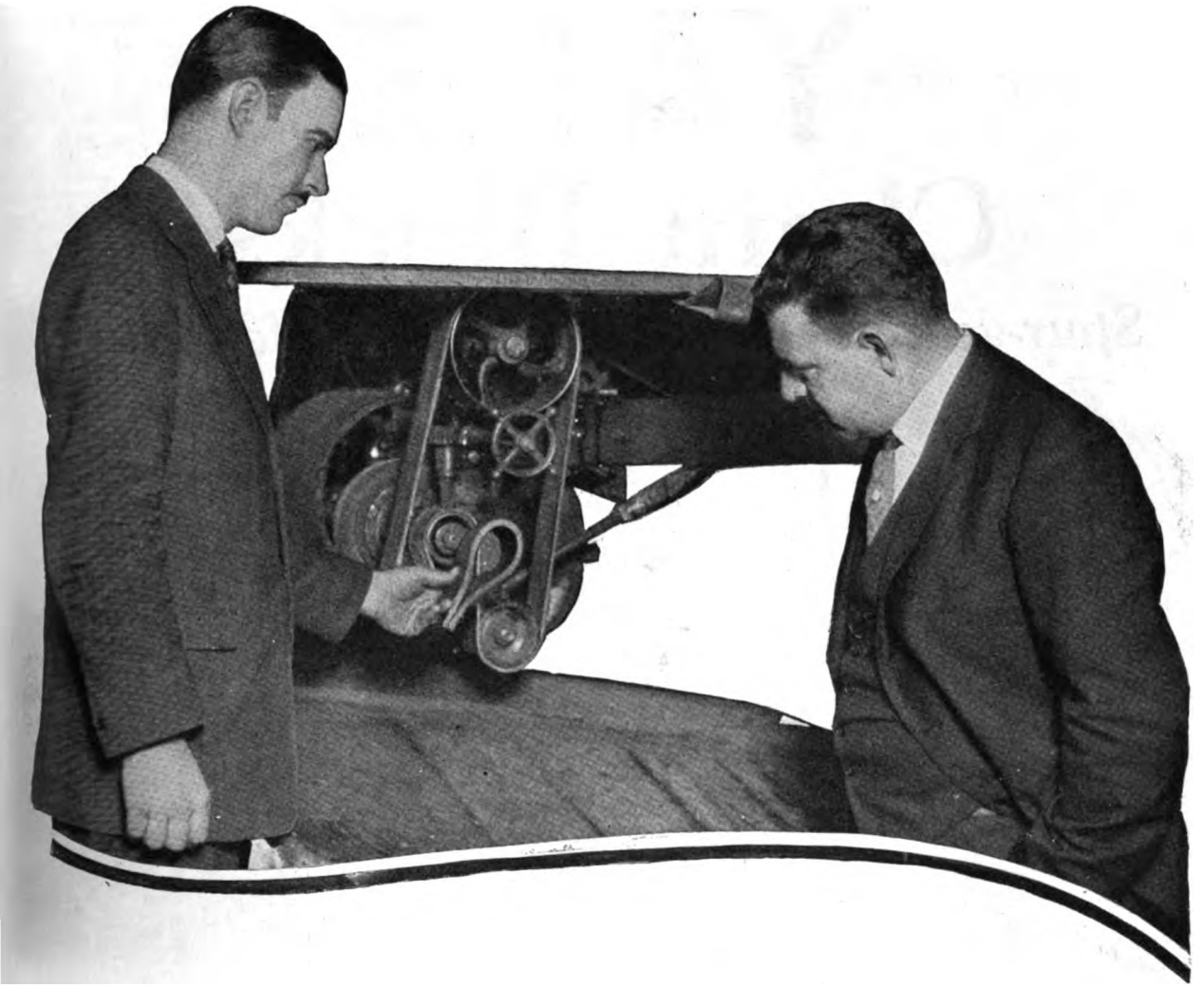
Helical cutters milling form tool blanks. This is the class of work to which they are especially adapted

Wherever helical mills were used an increase in production occurred. This increase averaged, for the most part, between 40% and 60%, though in many cases even greater increases were obtained. The elimination of entire operations or the freeing of machine equipment to do other work, together with the increasing of production, are advantages regularly gained by using this type of milling cutter wherever it is applicable.



Two opposed helical cutters milling table gibs for milling machines.

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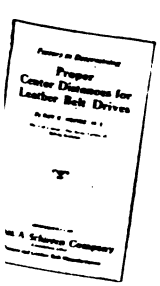


These are the belts for *small* pulleys

(*because they are more pliable*)

Small pulleys require the most pliable belting. It has got to be able to *get down and bend,* perhaps a thousand times a minute. Flex a piece of stiff belting in your hands and see how inadequately it meets the demands of small pulleys.

Duxbak Belting always lasts longer on small pulleys just because it is pliable. The next time you buy belting for small pulleys make sure it is pliable belting.



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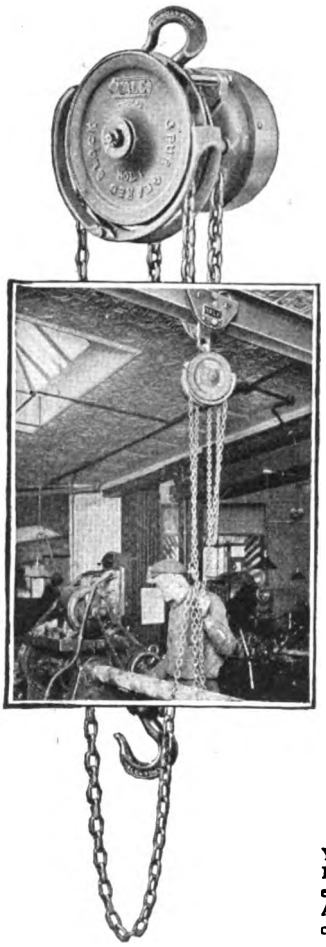
DUXBAK WATERPROOF LEATHER BELTING

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TRADE **YALE** MARK

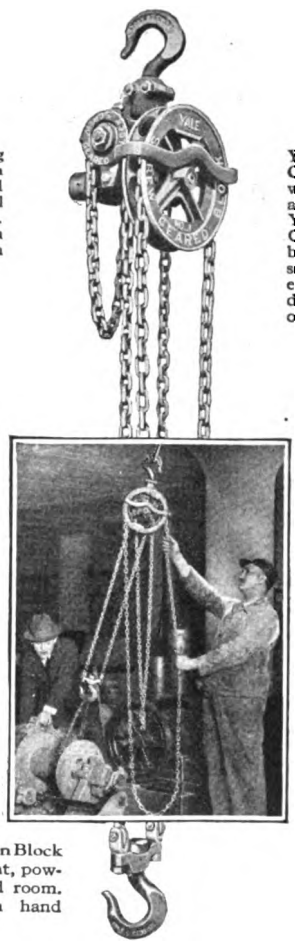
Chain Blocks

Spur-geared — Screw-geared — Differential



1

Yale Ball-Bearing Spur-geared Chain Block. Easy and safe operation. All parts Yale-made. One man can lift a load of 1 ton with one hand.



2

Yale Screw-geared Chain Block For portable use. Light, powerful, takes up less head room. A pull of 87 lbs. on hand chain lifts a 1 ton load.

3

Yale Differential Chain Block. Made with the same care and precision as the Yale Spur-geared Chain Blocks. Embodies strength and security and is the easiest operated differential block on the market.



Whatever type of chain block is required for your work, Yale makes it and makes it better. Yale bases its claims of superiority on its unwillingness to have any parts of blocks bearing the name Yale made in any other plant. Comparative tests have again and again demonstrated to us the wisdom of this policy. Not only are Yale Chain Blocks all Yale-made—but they are vastly better in design and construction. You can do more with a Yale Chain Block and you can do it more easily.

DO YOU KNOW? Spur-geared — Screw-geared — Differential — which of thes blocks is best suited for your purpose? Let the Yale representative tell you—or write direct describing type of work being done, for full unbiased information.

The Yale & Towne Mfg. Co., Stamford, Conn., U.S.A.

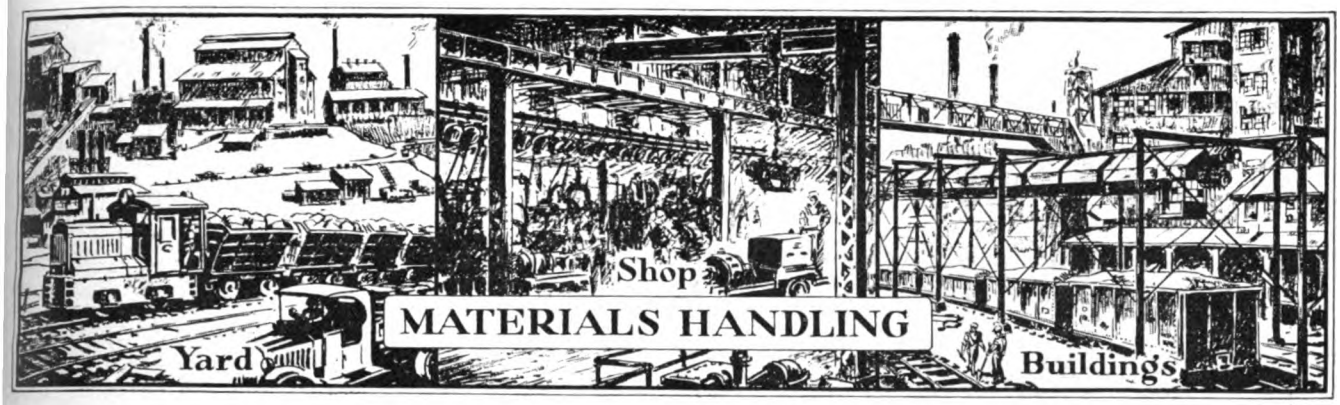
Canadian Branch at St. Catharines, Ontario

YALE MARKED IS YALE MADE

YALE Hoisting and Conveying Systems

For p tised in this issue write Industry Illustrated

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Fifty Percent. More Goods

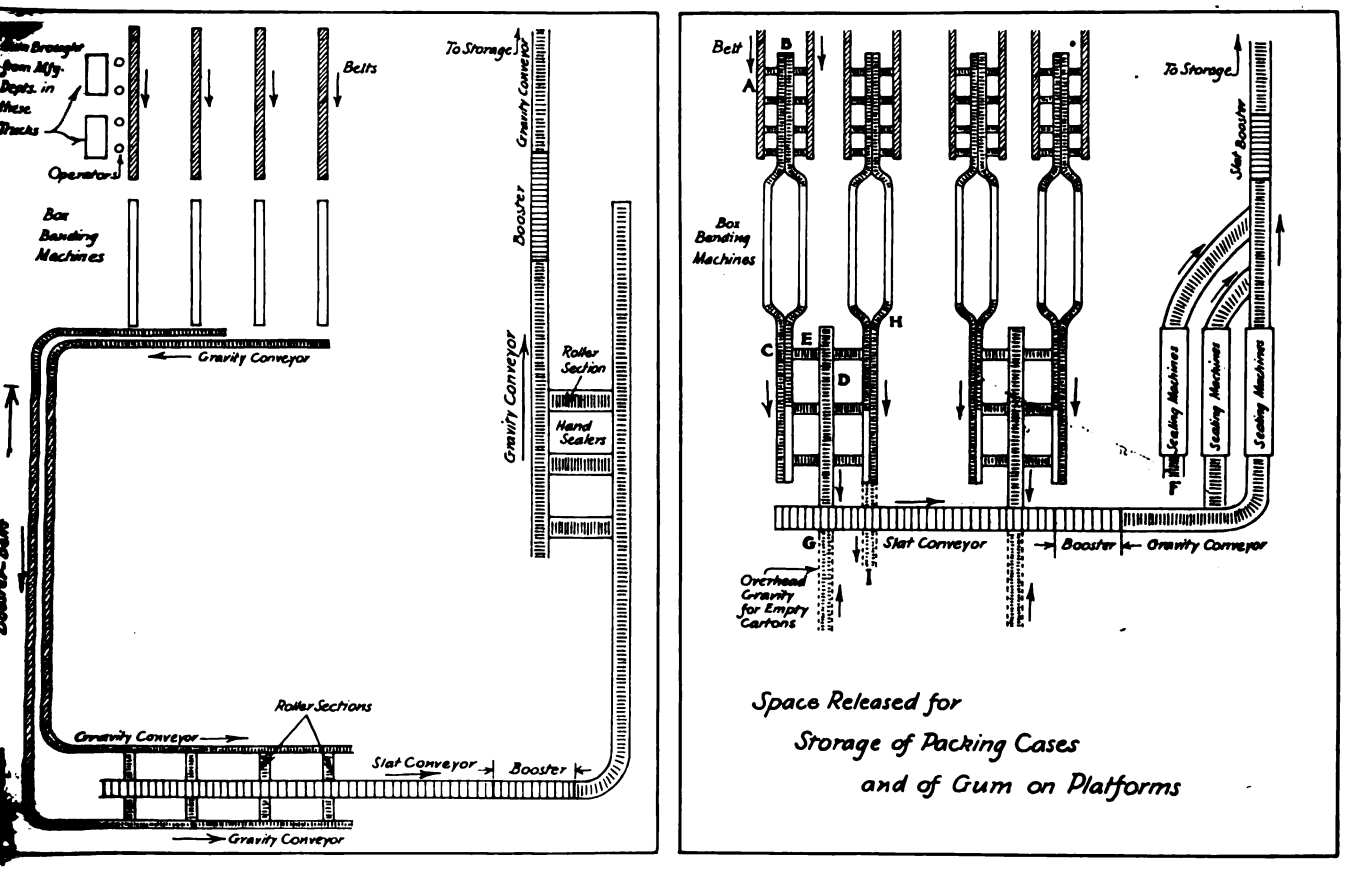
By Leon I. Thomas

Packed in Less Space

A Re-planned Conveyor System Did It

THE easy way to get more space for manufacturing is to build additional plant. But the real test of management is to increase output by making better use of the space you already have. One way of doing this is to re-study your mechanical handling system to see if it cannot be compressed into a still smaller space than it now occupies. The arrangement of conveyors in packing rooms is often susceptible of considerable improvement. This is just what has been accomplished during the past few months at the Chicago plant of the William Wrigley, Jr., Company in its packing department.

Since the change 50% more gum is packed than before and in less space. This was accomplished largely through a rearrangement of the various types of conveyors which this company uses. The gum comes from the manufacturing departments on belt conveyors in small boxes, each containing 20 packages. (See next page.)

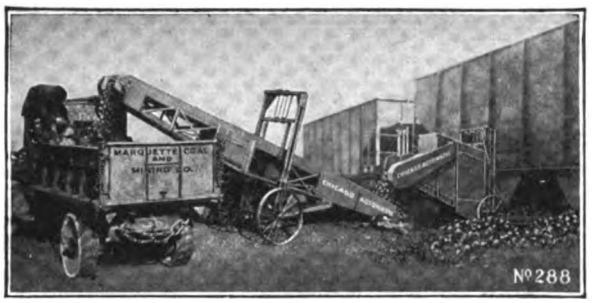


The original layout of the conveyors in the packing room of the Wrigley Company is shown at the left. After the conveyors have been rearranged, as shown at the right, the packing capacity was increased by half and the space occupied diminished one-third.

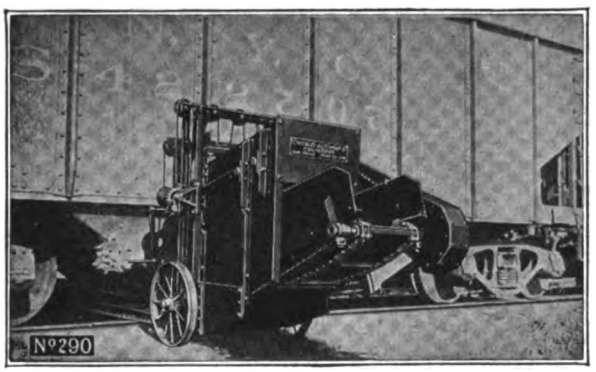
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CHICAGO AUTOMATIC

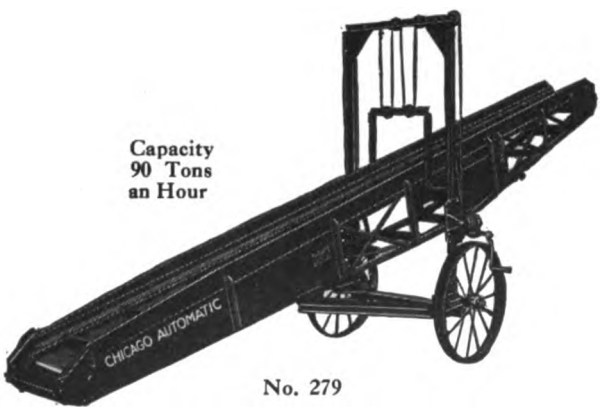
Conveyors and Track Unloaders Make Possible a Ton a Minute Car Unloading



Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use 90 tons an hour is the capacity of both machines



The Model T. U. goes under any car and handles all classes of fuel



This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable conveyor

982 Old Colony Bldg. Chicago

Representatives desired for several Industrial Centers

(*Continued from page 77*)

The packing operation in this plant consists of inspection and inserting a premium coupon in each of the boxes and then sealing them by sticking on a paper band. These boxes are then packed in fibre cases, 50 to the case. After this they are sealed and shipped.

Formerly the packing room was arranged as shown in Sketch No. 1. A glance at Sketch No. 2 shows the relative amount of space saved and the general rearrangement by which this saving was made possible.

Referring again to Sketch No. 2, traveling belts deliver the gum from the manufacturing departments to point "A," where girls insert the coupons in the boxes. Then the boxes are put on conveyor "B," which takes them to the box-banding machines. After passing through the banding machines, girls then place the boxes on narrow gravity conveyors "C."



Interior of the packing room whose plans are shown on page 77. This illustrates the types of gravity and power conveyors used.

The change from wide to narrow conveyor is possible without congestion for the reason that when placed on the narrow conveyor, the boxes are piled ten high whereas on the wide incoming belt they come in, each one separately. And since the boxes come to the case packers in piles, each ten boxes deep, the work of packing is greatly facilitated.

The packers stand in the space between the gravity conveyors "C" and "D." The case to be packed rests on a short piece of cross conveyor "E" of the roller gravity type so that no lifting of the packed case is required.

The filled fibre cases then travel on roller conveyor to the end of the section, turn and pass on a slat conveyor to the despatcher's station at "F." It is the despatcher's job to switch them to the proper sealing machine of which there are three. Each one is set up for a given size of case.

The supply of empty cartons comes to the packing positions on overhead gravity conveyors which enter at point "G."

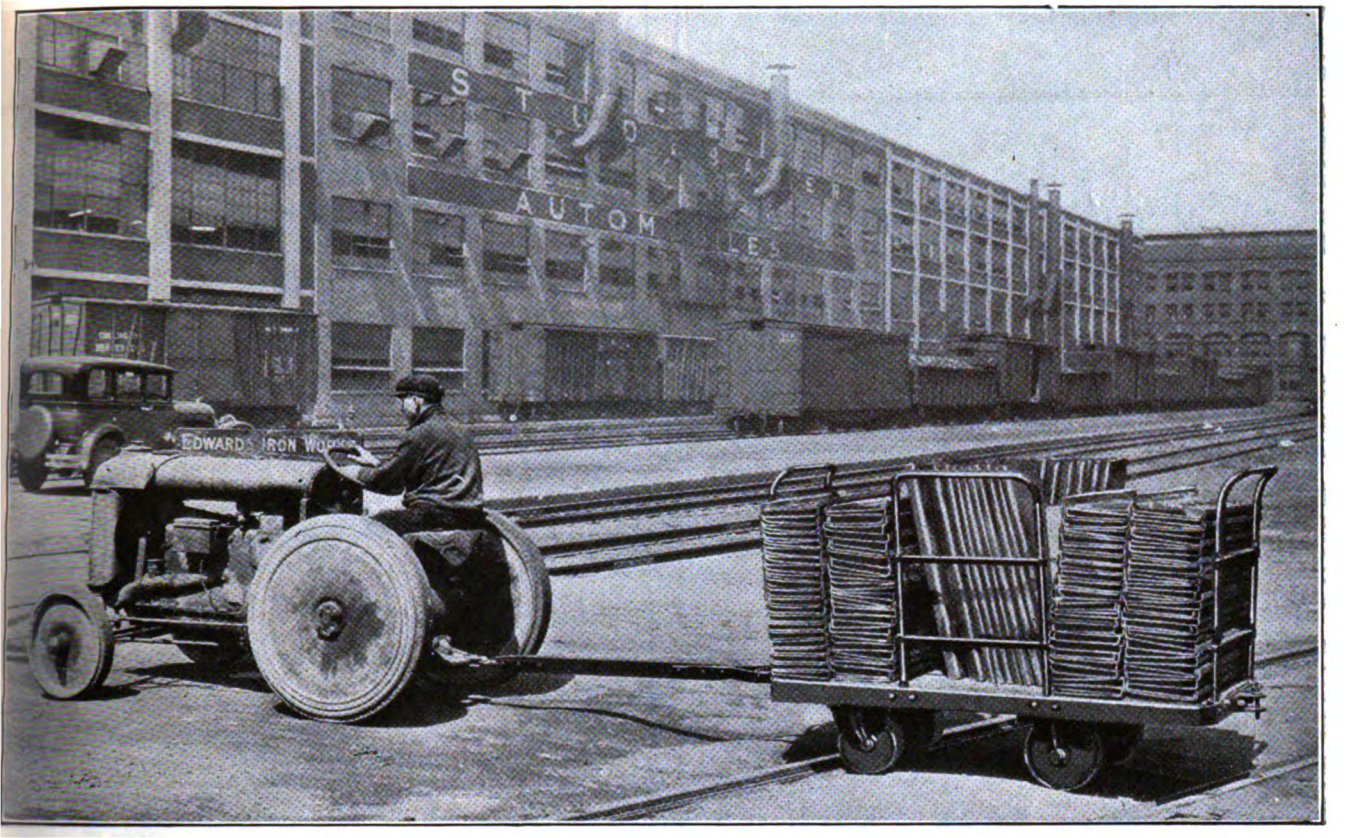
"Mixed lot" shipments do not follow this entire procedure but leave the regular conveyor on an overhead gravity conveyor and discharge at "I."

Knocked-down cases are stored on the first floor level in an adjacent building, and come up to the packing room, which is on the second floor, by an inclined slat conveyor.

As the sketches show, the new route is shorter than

(*Continued on page 80*)

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Hyatt equipped "Sippel" Truck built by Wm. H. Sippel Co., South Bend, Ind., carrying 2½ tons over fifteen miles of rough going at speeds ranging from 5 to 12 miles per hour. The truck and its Hyatt bearings performed flawlessly under these breakdown conditions.

Brutes for Punishment

THE remarkable stamina and consistently fine performance of "Sippel" Trucks was again demonstrated when the "Sippel" shown above carried an extra capacity load of 5000 lbs. over fifteen miles of broken pavements, railroad tracks and loose-fitting manhole covers.

Shocks of load and impact were easily absorbed by the sturdy Hyatt Roller Bearings in the wheels. As a result, there was not the slightest indication of damage to the truck or any part of its load.

This emphasizes why Hyatt Roller Bearings are standard with Sippel and so many other manufacturers of fine trucks.

Hyatts are giving the same high grade performance in many other types of material handling equipment. They are practically frictionless and wearproof. They guard permanently against delays, breakdowns and irregular service. They operate for months without renewal of lubricant—and for years with no other attention.

Why not keep loads moving easily and cheaply by specifying Hyatt Roller Bearings for all your material handling equipment?

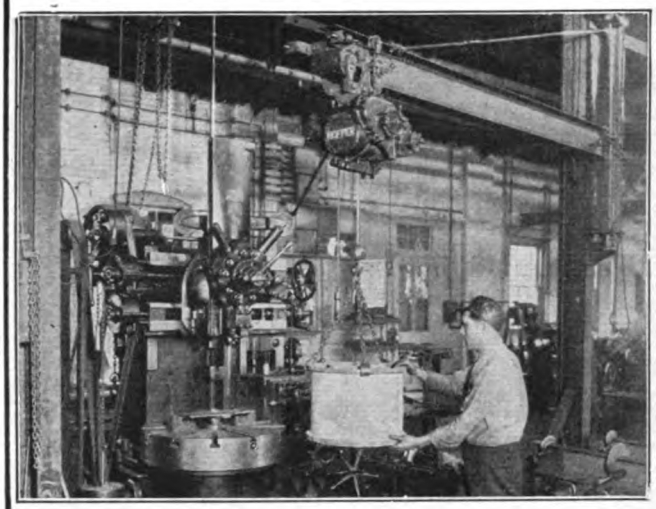
HYATT ROLLER BEARING COMPANY

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PRODUCT OF GENERAL MOTORS

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SPEED-UP PRODUCTION
WITH
ROEPER ELECTRIC HOISTS

Every moment your machines stand idle, you are losing production—this means profit

A ROEPER Type "R" Electric Hoist enables operators to keep machines busy without waiting for a lift by other men or the big traveling crane

Our Bulletin gives full details.

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Traveling Cranes Electric Hoists Trolleys

POWER

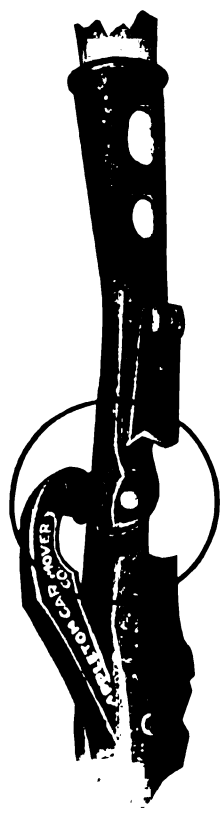
The moving of heavily loaded cars requires a great amount of power.

The very appearance of the Atlas Car Mover suggests power. Its scientific construction develops power, sufficient to move the heaviest cars and still have a margin of reserve.

Its positive grip spurs never fail to hold and assure perfect safety.

A locomotive as far as practical results go, it places cars with an astonishing speed and ease.

OUR POLICY IS TO SELL THRU THE JOBBER



The Famous
ATLAS CAR MOVER
Manufactured Only by
Appleton Car Mover Co.
Appleton, Wis.

(*Continued from page* 78)

the old one. The released space is used for the storage of empty fire packing cases and of gum on platforms. It should be explained that not all the gum is packed in fibre cases according to the routine described in this article—some of it is diverted by overhead conveyor as explained above and goes to the shipping department on platforms hauled by elevating truck. This departure from standard handling procedure of the bulk of the product is to accommodate the shipping of mixed lots. And it is these platforms which occupy the space released by the new arrangement.

While we do not all make gum, a similar layout is entirely applicable to any other small product which is to be boxed, sealed and packed in containers. It is flexible enough to be applicable to a single kind of product or to one which comes in several kinds and sizes.

Three Ton High Lift Truck Has Frictionless Bearings

A NEW heavy duty electric elevating truck has been added to the line of one manufacturer, in order to fulfill the requirements for ever increasing loads on electric industrial trucks. Advantage has been taken of the excellent features that experience has introduced into the older units, and at the same time the cost has been maintained at a reasonable figure by the use of pressed steel, drop forgings, dies, and general production methods.

The back-bone of the frame work comprises mainly a large gusset plate, one-half inch thick, and extending from the very forward end of the truck to the small or trailing wheels. This plate is approximately 24 inches in height, at driving wheel axle and in addition to forming the frame work, it provides a yoke to serve as a guide for the drive unit and the spring suspension of the truck. The upright channels or platform roller guides are attached to this gusset plate through ¾-inch diameter rivets, and in addition by welding strips of steel either side of the vertical channels to serve as a pocket or guide. By the use of these strips, it is still possible to remove the upright channels for any change or replacement that may be desired. In order to get the necessary stiffness and also in order to provide enough width or surface on which the platform rollers are to bear, a ship channel has been applied.

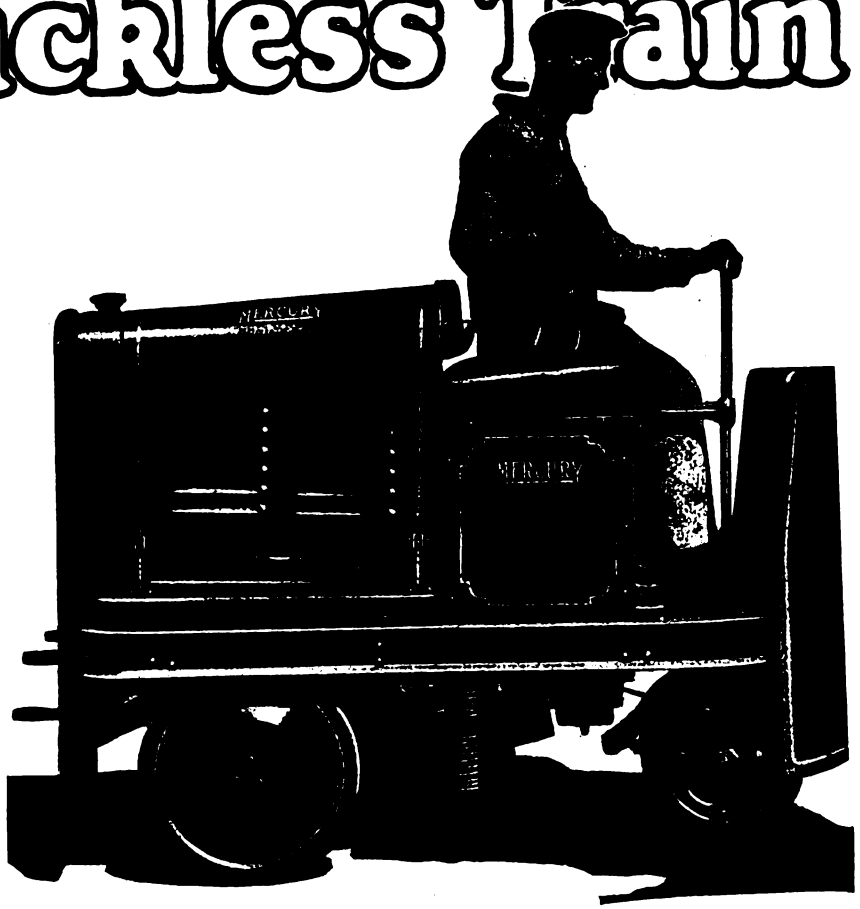
The structural parts of the truck are joined with ⅝-inch and ¾-inch rivets, in order to provide sufficient strength, and mainly in order to allow the use of a rivet that is large enough to retain its heat during the riveting operation.

The elevating platform is raised and lowered through the medium of a 1½-inch diamond roller chain, passing over a power-driven sprocket at the bottom, and an idler sprocket at the top. In order to reduce friction to a minimum, heavy duty roller bearings are employed in the idler sprocket at the top of the machine. The shafts of the lower sheaves run in a bath of oil, which also serves to lubricate the spur-gear reduction unit. The two ends of the roller chain are attached to the platform through a spring take-up device, which will automatically adjust itself as the chain wears. It is estimated that the

(*Continued on page* 82)

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The Trackless Train

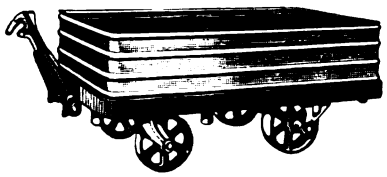


— and to be pulled by the tractor —

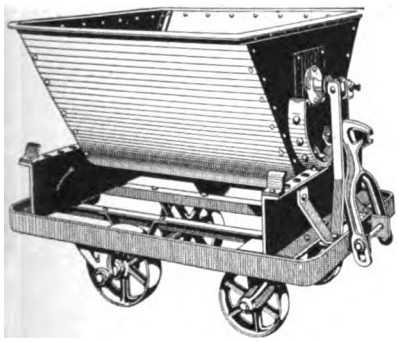
there are the Mercury trailers — — a few of the standard types are shown below.



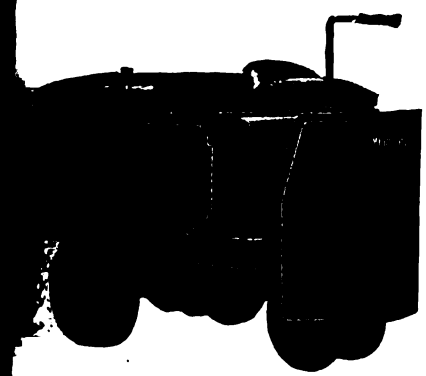
A-310 — *all purpose castor steer. Built in a wide range of platform widths and lengths. Ask for bulletin A-100.*



A-310-21 — *fitted with corrugated box body for small parts. Any Mercury trailer can be had with steel or rubber tired wheels. Ask for bulletin A-120.*



A-370 — *gravity dump body—½, ¾ and 1 cu. yd. capacities are standard. Ask for bulletin A-125.*



Mercury storage battery Tractors are offered in 3 types and 9 models. Literature upon request.

—and now— — a Mercury *Gas* Tractor

You will want to know all about this latest addition to the Mercury line. Designed and built by an organization with fourteen years pioneering experience in the field. Incorporating features that have been proven indispensable in the efficient operation of industrial tractors.

A four cylinder, 18 H. P. gas engine (*plenty of peppy power*)—standard automobile control (*any one can operate*)—Mercury internal gear rear axle (*all the power delivered to the wheels*)—tiller bar steer (*clear driving vision*)—short turning radius—compact overall dimensions—2,400 lb. ultimate draw-bar pull (*50 ton train*)—speed ½ to 9 M. P. H. (*controlled by governor*).

For the complete story ask for Bulletin No. 110

Mercury

Manufacturing Company

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In a Tight Place



NARROW aisles, ramps and runways hold no terrors for the Lakewood 703-LS Tier-Lift. This machine was designed especially for congested work. Its turning radius is shorter than any other standard machine of equal capacity.

The Lakewood 7-3-LS lifts a 2-ton load at the rate of one inch per second—appreciably faster than any other truck of the low lift type.

The complete line of Lakewood Tier-Lift Trucks is detailed in a new catalog just off the press. Tell your stenographer to send for Bulletin 35-I.

The
LAKEWOOD
Engineering Company
Cleveland, Ohio

(*Continued from page* 80)

of this hoisting chain in normal service will exceed five years.

The hoisting motor is connected to the spur-gear pinion through a spring ratchet, so arranged that a positive drive is obtained when raising the elevating platform. If, however, the platform was checked in its downward travel, the ratchet would merely release, and, therefore, cause no injury to the mechanism of the truck. The ratchet when slipping makes considerable noise, so that the operator is immediately warned of the fact that the truck platform is bearing on some obstruction. Due to the high efficiency of the roller chain and the spur-gear reduction in the hoist unit a speed of 7½ feet per minute is obtained when lifting a full load, and a speed of 19 feet per minute when raising the empty platform. The lowering speed is 19 feet per minute loaded or empty.

The elevating platform of the truck is supported in the horizontal position by four rollers bearing on the inside of the flanges of the vertical ship channels. These channels have a depth of 9 inches and a flange of 3½ inches, so that a relatively large diameter roller, with a wide face, is possible. To reduce friction to a minimum, the rollers are equipped with "heavy duty" roller bear-



ings, and with a hardened steel thrust washer to take whatever end thrust may occur when lifting loads that are not placed on the center line of the platform. The pins which serve as a spindle for the roller bearings are made eccentric, so that by rotating the pins the platform may be tilted upward or downward to compensate for any wear that may result, after a period of years, on the surface of the rollers and on the face of the vertical channels. The platform members are heavy steel castings having large diameter bosses to support the platform roller pins. The castings are shaped to reach around the vertical channels and at the same time permit the use of an elevating platform narrow enough to clear standard skids. The platform has an overall width of 27 inches, a height of 11 inches and a length of 54 inches.

By placing the elevating or hoist unit between the vertical roller channels, all of the available space is utilized, with the result that the overall length of the machine when in operating condition is cut to a minimum. The hoist unit in this position is accessible for any servicing or inspection that may be required, and provides the further advantage that it separates the elevating roll

(*Continued on page* 84)

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A few of the many "C-M" money and time savers. Our catalog shows the complete line. Write for it.



Cyclone Hoist



Electric Hoist



Hand push crane



I beam crane



Matchless Trolley



Low Headroom Hoist

This "CM" Hoist *Plus* This Man Freed Three Men *from* This Particular Job







THE payroll saving on this particular job was over $3000 the first year that the "C-M" electric Hoist was used.

Just as important, the one man and the hoist do more work than the four men formerly did—and do it in less time. Less space is required for the job.

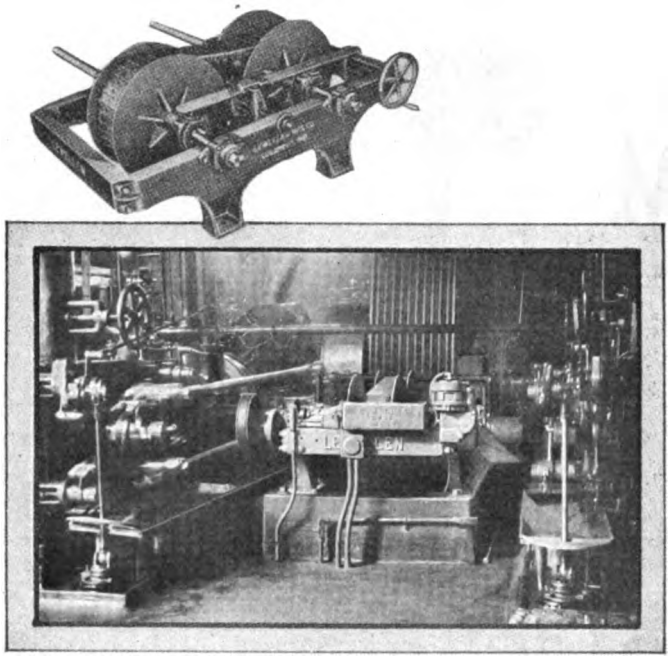
If, in your business, heavy loads have to be lifted, moved from one place to another or stacked high to save space, a "C-M" idea plus "C-M" equipment can make savings for you similar to those described above. A "C-M" material handling engineer will gladly show you how—without obligation. Write



Write for our Pamphlet "$1.65 an hour or 61c an hour." It is free.

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LEWELLEN Transmissions prove their worth in the Paper Industry as well as on other manufacturing processes.

The illustration above shows a No. 13, class "C" LEWELLEN Complete Ball Bearing Transmission with remote electrical control driving an engine governor of a Hamilton cross-compound engine in the plant of the Gardner-Harvey Paper Company, Middletown, Ohio. This not only controls the speed of the engine but automatically maintains a uniform paper thickness.

Throughout the paper industry where speed on machines must be under control at all times, many LEWELLEN Transmissions are now in use.

The paper industry is but one of the many industries where LEWELLEN Transmissions give accurate speed control to a fraction of an R.P.M.

There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN Transmissions do not jerk. Speeds can be varied gradually from fast to slow and slow to fast as required.

Write for the LEWELLEN Catalog.

LEWELLEN MFG. CO.
Columbus, Indiana

LEWELLEN
Variable Speed
TRANSM[illegible]ON

For proc[illegible]d in this issue write Industry Illustrated

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(*Continued from page* 82)

channels a distance sufficient to give a very high degree of visibility for the operator when driving the machine.

The main drive unit is of the double reduction spur-gear type, driving the wheels through totally enclosed universal joints. The entire gear reduction with its differential and bearings run in a bath of oil.

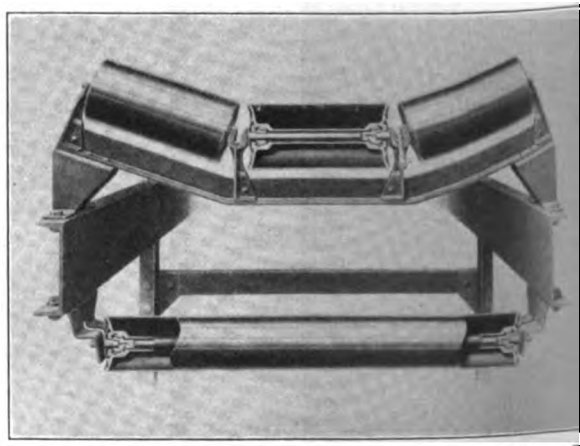
In order to reduce the physical effort necessary to steer a machine of this heavy capacity, the steering knuckle king pins have been fitted with ball and roller thrust bearings which puts the entire weight of the machine on anti-friction bearings. On the small wheels which come directly beneath the load, the steering knuckle king pins, in addition to being fitted with the roller thrust bearings, are also equipped with an upper and lower roller bearing to take the radial load. These small wheels are fitted with roller bearings on all the moving parts and each wheel assembly contains five bearings. Tests made with this machine carrying the full capacity load of 6,000 pounds, show that the pressure required at the operator's handle to steer the wheels is less than was formerly required on the 2-ton machines which were equipped with hardened pins and ground bushings where roller bearings are now employed.

A four-wheel steer feature allows a turning radius of 96 inches to the outside edge of the truck.

The design and strength of the joint between the vertical roller channels and the structural frame members, make it unnecessary to have any trusses or structural members reaching diagonally from the top of the roller channels to the operator's back-rest. By omitting these braces, it is possible to leave the top of the battery box clear and permit servicing or watering of the battery without sliding out the battery, or performing any other laborious operation. The battery itself may be removed by hoisting it out of the battery box, or else by removing the side plate to the box and sliding the battery out sideways.

Belt Conveyor Idler Now Made With Roller Bearings

HERE is a new type of anti-friction belt conveyor idler and return rolls, in which all the bearings are of the tapered roller bearing type, which are totally enclosed within the roll hub.



Three-roll anti-friction troughing idler and return idler. C[illegible] away shows construction of rolls.

The outstanding feature of the idler is the absolute protection afforded by a labyrinth grease seal, mount[illegible]

(*Continued on page* 86)



The man who wants to reduce should avoid Bassicks



—Whatever the load—whatever the floor—Bassicks take up their burden quickly—and "carry on"—smoothly—easily—quietly—and safely. Over the bumps—and gulleys with balloon-tire ease. Efficient—economical—dependable always—

How easily it rolls on Bassicks

Take the Bassick Harvard Steel Ball Bearing Truck Caster—for instance—

THIS sturdy fellow—carries a heavy, embossed steel top plate reinforced by independent ball cup—giving double thickness of metal and double strength at all vital points.

Tapped ball bearings. Specially annealed, extra heavy king pin. Heavy gauge steel horn of high tensile strength.

Spanner bushing riveted solid between forks of the horn gives protection to axle—strengthens horn and prevents it bending inward under weight and binding the wheel, and gives a larger bearing surface for the wheel.

Result—longer life and easier rolling—easier turning.

Sounds sturdy enough to carry a "Big Bertha", doesn't it?

And that is but one of the Bassick family. Send for Catalog F-104

Bassick Reg. U. S. Pat. Off. **Casters**

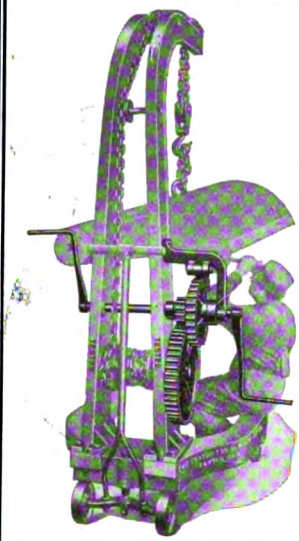
The BASSICK COMPANY
(A Division of Stewart Warner)
BRIDGEPORT, CONN.

For thirty-one years the leading makers of Better Casters for home, office, hotel, hospital, warehouse and factory.

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The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



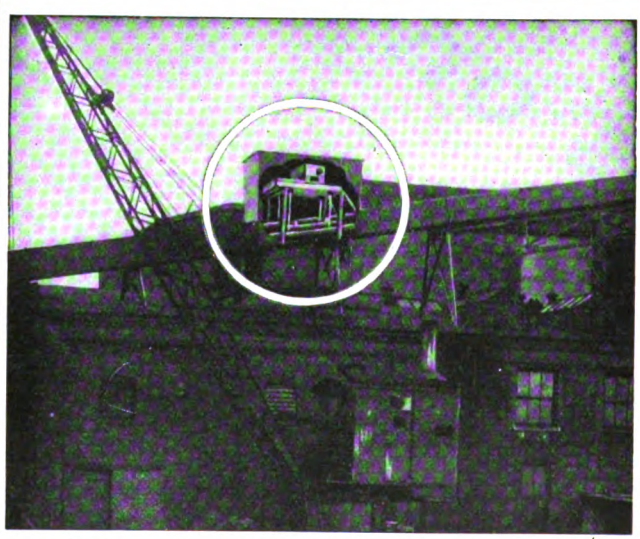
The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

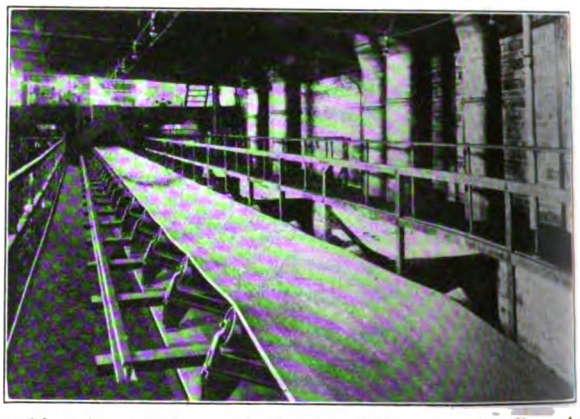
Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.
180 Autumn St. Pas[illegible] I.

(*Continued from page 84*)

in a grease cap which also serves as an outboard reservoir and lubricates the bearing on the outside as well as on the inside, especially when the roll is on an incline. This, in turn, is protected by a deflector plate, which deflects dirt, dust, grit or any foreign material away from the bearings and grease seal, and will not permit the washing of the grease away from the labyrinth.

The rolls are mounted on a self-cleaning "T" base. All rolls are interchangeable, being capable of serving in any of the three positions. The entire frame is riveted, and is without bolt or nut to work loose or to come out of adjustment.



Looking from Drive end showing 36" automatic self-reversing tripper and belt conveyor.

Special care is exercised in the machining of the roll shell, to obtain uniformity of thickness of the wall into which the machined heads are pressed and securely held in place by spinning. The heads are dished for rigidity and strength, and the entire construction is such as results in maximum strength.

A special iron has been developed for use in coke plants, that resists the corrosive action of sulphuric fumes and the abrasiveness of coke dust. The rolls have been granitized for the handling of certain types of material such as salt, alkali and various other materials that cause incrustation, pitting and rusting of ordinary steel or iron.

The idler rolls are supported in malleable iron brackets having a large bearing surface for supporting them, and they are not dependent upon the use of slots. The brackets are so constructed as to support the ends of two adjacent rolls, thus obtaining perfect alignment of rolls.

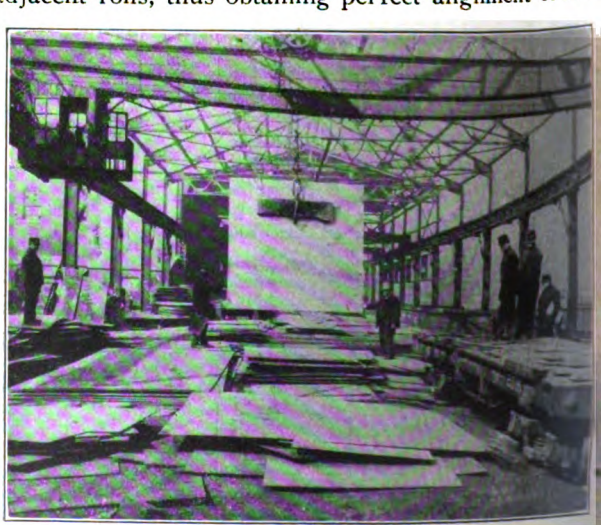
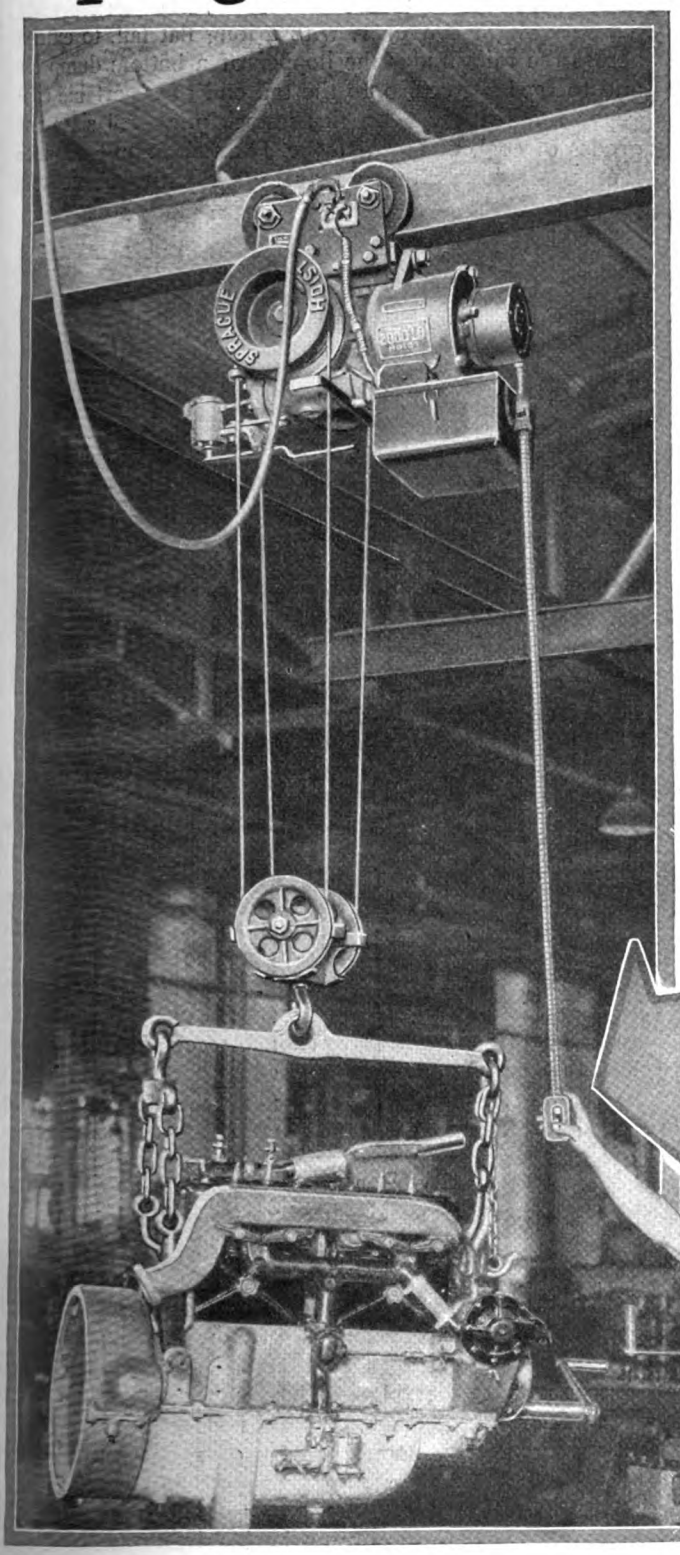


Photo Ewing Galloway

Electro magnets simplify the handling of large plates by crane to and from the plate dock.

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Sprague Push Button Control



simple, sure and safe

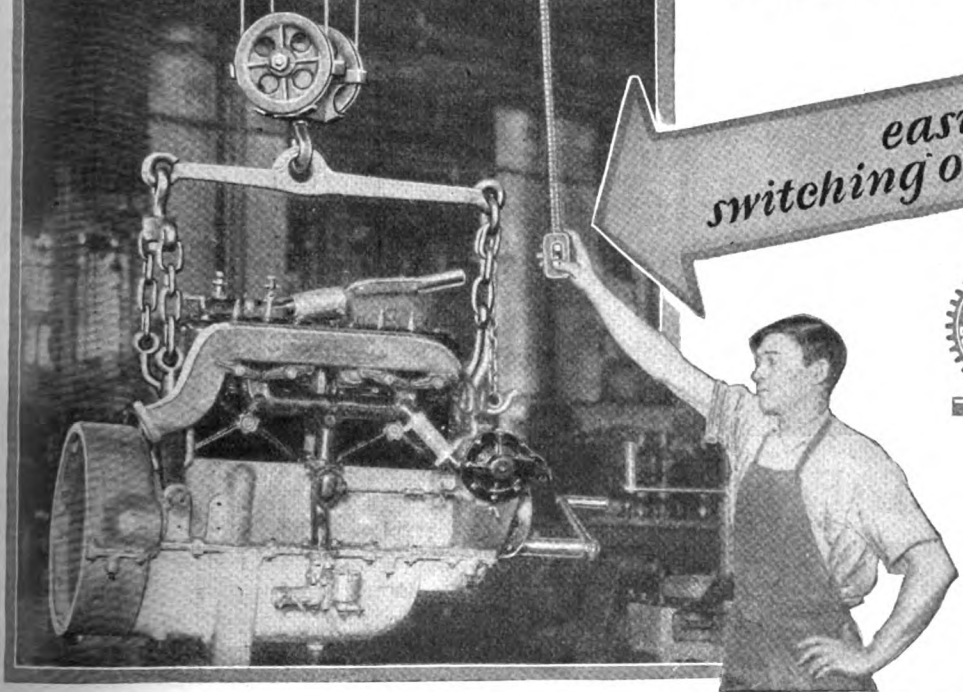
Consider these advantages:

1. Very accurate setting of the load, which may be jogged a fraction of an inch at a time.
2. Push Button Station is held in one hand, allowing one hand free to adjust the load.
3. Two hoists may be operated simultaneously by one man in handling long loads, with both hoists always under instant control.
4. Rapid acceleration, because the push button operates the contactors almost instantaneously.
5. Push Button Station may be installed at remote point, if necessary.
6. With remote control, as many push button stations may be used as desired, for all contactors are mechanically interlocked.

Sprague Electric Hoists with Push Button Control are supplied in ¼, ½, 1, 2, 3, 4, 5 and 6 ton capacities for direct and alternating current. They are worm driven, very simple in construction, thoroughly enclosed, and provide a trustworthy service that cuts handling costs and speeds up production.

Write for illustrated and descriptive bulletin.

easy as switching on a light



SPRAGUE ELECTRIC HOISTS

DIVISION OF
SHEPARD ELECTRIC CRANE & HOIST CO.
30 CHURCH ST. NEW YORK, N.Y.

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PICKLING BASKETS



Pickling baskets made from metal of proved quality for its resistance to corrosion and sulphuric solutions.

Welded with infinite care and thoroughly inspected before delivery.

We build them to your specifications, any size, any quantity. If you have a pickling problem our engineers will help you to solve it.

Send us blue print or pencil sketch

THE BREESE BROS. CO.
CINCINNATI, OHIO

FABRICATORS OF

Steel, Iron, Brass, Copper, Monel Metal--Requiring Stamping, Forming, Drawing, Blanking, Punching

See Data A. S. M. E. Condensed Catalogue of Mechanical Equipment, McRae-Hendricks and Thomas Catalogues.



DIEHL EXHAUST FANS

DIEHL Exhaust Fans provide controlled ventilation—without drafts, for factory rooms and offices. Air fouled rooms impede workers' output both in quantity and quality. Improve conditions in your factory rooms and offices with DIEHL Exhaust Fans.

Write for descriptive bulletins—now.

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ATLANTA BOSTON CHICAGO NEW YORK PHILADELPHIA

DIEHL

ESTABLISHED

Portable Unloader for Hopper Bottom Cars

THERE has been put on the market a new unloader for coal cars and the like, which can be operated wherever the car is spotted. It is primarily an especially designed flight conveyor, with a long flat tail, to extend across the rails under the hopper of a bottom dump car and to feed the coal onto the tail end of a portable conveyor for delivery to truck or stock pile. All sizes and grades of coal, as well as coke, from slack up to 16-inch lumps, are handled at an average capacity of 60 tons per hour.

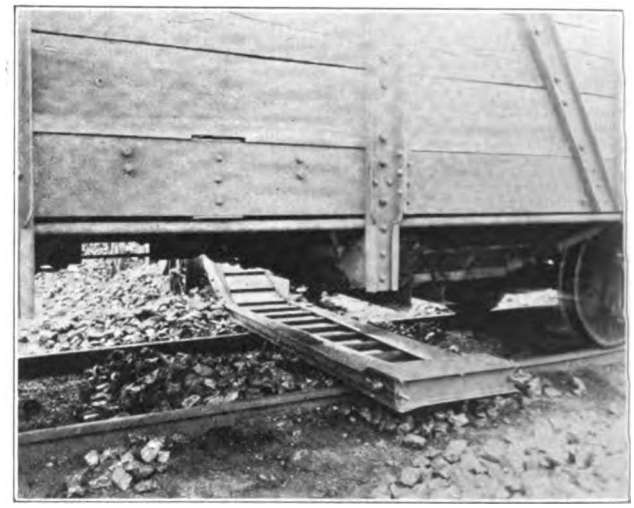


Fig. 1. The tail end of the conveyor showing the amount of clearance between it and the car hopper.

It consists of a double chain flight conveyor contained in a steel body mounted on an adjustable truck, and driven by an electric motor. The conveyor is 18 inches wide and is made up of 2-inch steel channel flights mounted, every 12 inches, between two strands of 1½-inch pitch, heavy, steel roller chain. The full width of 18 inches is available for pushing the coal. The flights travel over a continuous 3/16-inch steel plate on which the coal drops. The flights moving over this plate push the coal before them out from under the car hopper and up a short incline to the delivery end, where it is discharged onto the loading end of another conveyor.

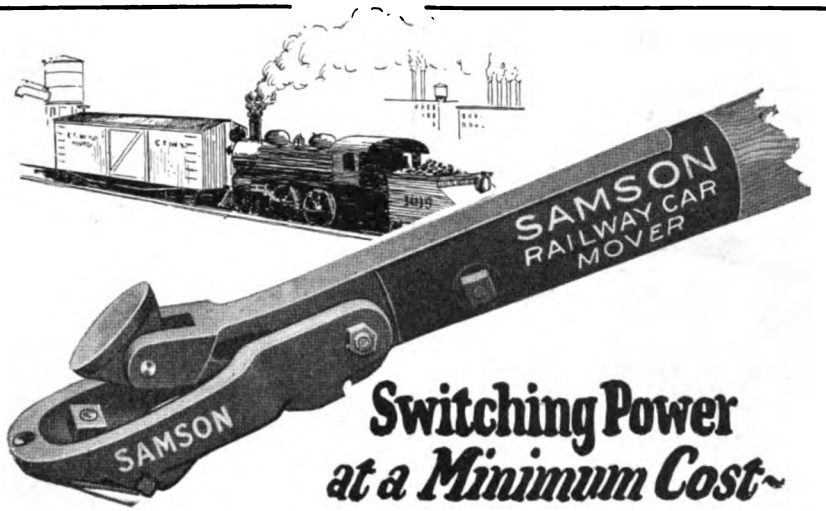
The feeder tail is 3⅜ inches thick and will fit under the hopper of any bottom dump coal car now in general use. The tail is entirely enclosed on the bottom to keep the flights from catching on the rails or from picking up coal or other material that might have accumulated between the rails. It is 18 inches wide so as to take coal without spillage from all types of hopper bottom cars. Flared feeder plates partly cover the conveyor in the feeding tail. This detail causes the conveyor to take the coal from the hopper evenly over its whole width and not only from one side.

A 5-horsepower electric motor equipped with ball bearings and pressure gun lubricating attachments drives the car unloader through a train of machine cut gears and steel roller chains. A clutch is provided on the countershaft for throwing the conveyor in and out of service without stopping the motor. All bearings are lined with phosphor bronze bushings, and a pressure system of lubrication is used throughout. A safety shear pin is provided in the drive machinery, which will shear

(*Continued on page* 90)

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Switching Power at a Minimum Cost~

To move a car loaded with 50,000 pounds with a Samson Rail Gripper Car Mover, your cost is between 1¢ and 2¢ per foot. One man moves the car easily, but with a crew of men your cost is 7¢ to 8¢ per foot. This difference in cost is the real reason for the wide use today in industry of Samson Rail Grippers.

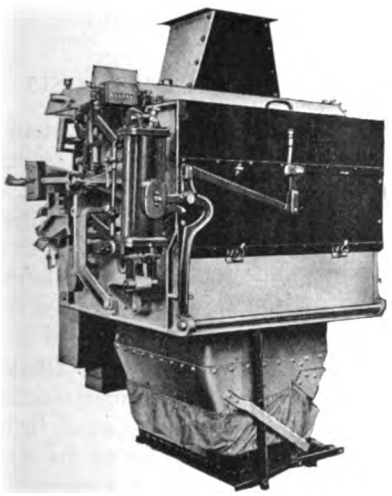
The Samson Rail Gripper Car Mover lasts a long time—all parts guaranteed—yet costs little. Every day you have one you'll save money. It is an appliance backed by thirty years' service, and the standard of hand power car movers. Get a Samson today and stop unnecessary expense. *Your dealer can supply you.*

G. D. ROWELL & SON, Appleton, Wisconsin

Samson RAIL GRIPPER

RICHARDSON INDUSTRIAL AUTOMATIC SCALES

Weigh Materials in Production without dust, fuss or attention



AUTOMATIC AND DUSTPROOF SCALES FOR

Coal	Alumina
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Clay	Feeds and Mashes
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ENTIRELY AUTOMATIC ACCURATE
DEPENDABLE RECORDS

Let a Richardson solve your problem.

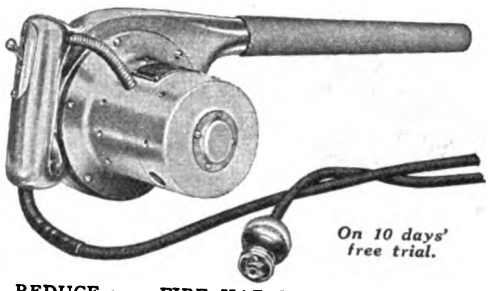
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RICHARDSON SCALE COMPANY, Clifton, N. J.

New York Chicago Boston Minneapolis Philadelphia
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Ball Bearing Portable Blower



On 10 days' free trial.

6½-lb. Air Cooled Ball Bearing Motor $45.00 Net

REDUCE your FIRE HAZARD and MOTOR TROUBLES by the frequent use of this "MARVEL" Portable Dust Blower, which gives a continuous blast of DRY air, for blowing inflammable dust our of your MOTORS and other machinery.

Ask us to ship you one on 10 DAYS TRIAL.

This tool is in daily use in several thousand industrial plants and saves its cost every year, several times. Has 20 feet high grade cable and armored plug. Perfectly balanced. Has TOGGLE SWITCH in handle, operated by thumb. Gives 16-in. water column pressure.

Note the Metal Conduit carrying wires from motor to handle.

Motor operates at 10,000-R.P.M. on "NORMA" BALL BEARINGS. This blower is a great time and labor saver, and its mechanical and electrical design gives assurance of a very long life, with a minimum of attention.

Made with UNIVERSAL motors (A.C. & D.C.) for both 110 volts and 220 volts. SHIPPING WEIGHT 18 lbs. Shipped on 10 days' trial, ANYWHERE.

A complete Set of VACUUM CLEANER ATTACHMENTS for $10.00 additional.



Manufactured by

ELECTRIC BLOWER COMPANY

352 Atlantic Avenue
Boston 9, Mass., U. S. A.



Cast Aluminum Wheels on

ROBINSON

Man Cooling

FANS



There is as much difference between ROBINSON MAN COOLING FANS and other makes as there is between one machine and another of the same type.

ROBINSON FANS are equipped with cast aluminum wheels which give

20% More Air at Same Speed With Less Power

These aluminum wheels require less power than any other propeller type wheel on the market. You will appreciate this if you believe in the utmost in fan efficiency at the lowest cost.

Write for descriptive literature and list of users

ROBINSON VENTILATING CO.

Zelienople, Pa.

ROBINSON

TURBINE & CONIFLO FANS

(*Continued from page* 88)

off and relieve the strain on motor, gears and chain in case the machine becomes blocked by some foreign substance or an excessively large lump of coal. The safety shear pin is easily replaced and its breaking delays operation only a few minutes and prevents the machine from being seriously damaged by unexpected loads.

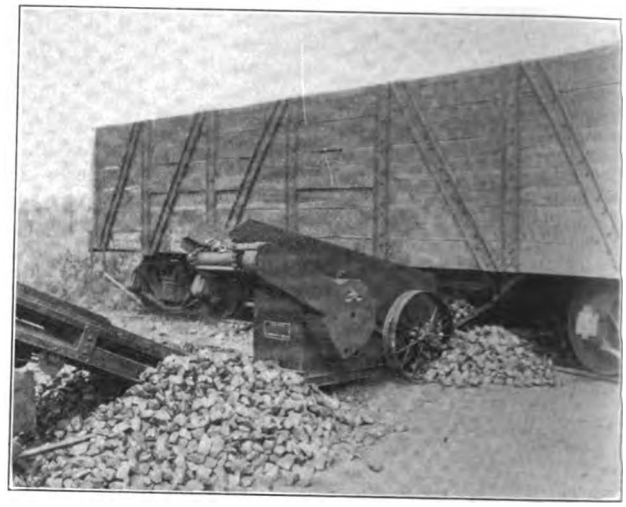


Fig. 2. The unloader in position to deposit coal on the flat angled take-away conveyor. This angle may be increased to nearly 90°.

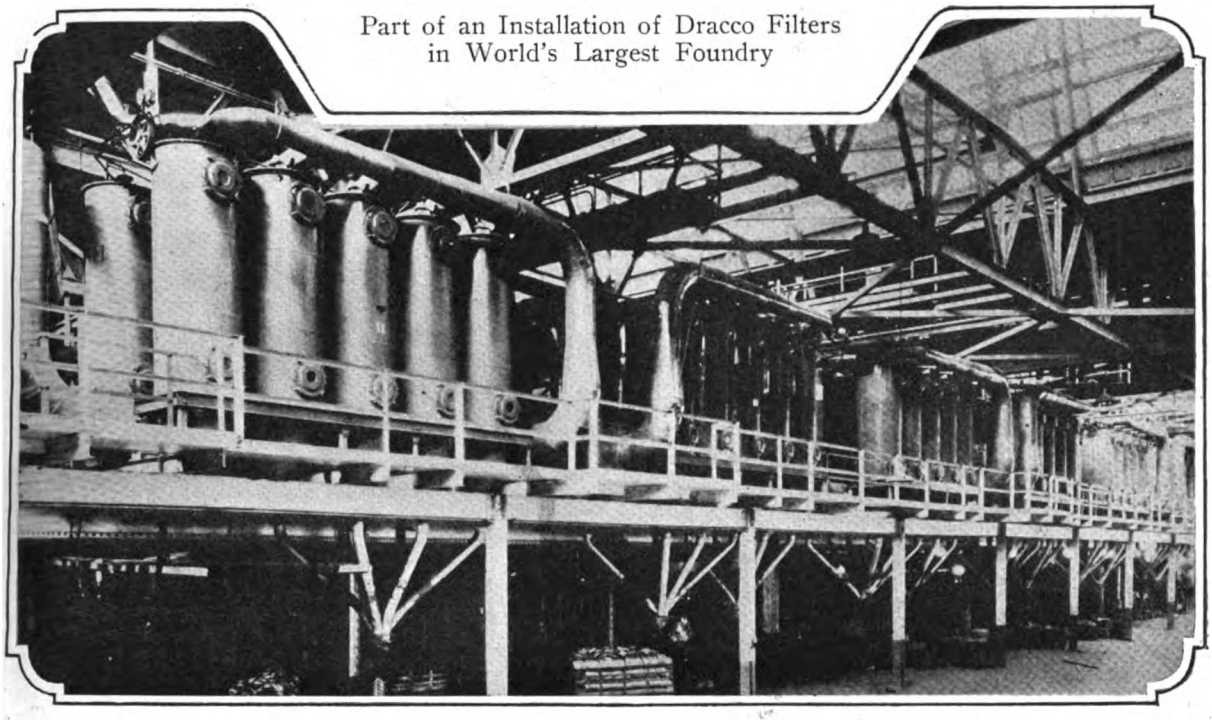
The wheels are mounted on an eccentric axle, which may be turned by a worm and wheel set, thereby raising and lowering the machine to compensate for differences in the height of the rails from the grade level. The machine weighs 2,600 lbs. and can readily be moved about by two men. The headshaft is so designed that the take-away conveyor may be set close enough to operate at any angle within an arc of 90° from the horizontal.

Budget Cuts Production Costs

THROUGH the application of budget system for control of expenses in all departments, the Belden Manufacturing Company of Chicago has reduced total overhead expenses about 12½ per cent., according to Harold V. Coes, general manager, in his article, "Budget Cuts Production Costs," in the Executives' Bulletin.

"Introduction of system immediately revealed overlapping of functions so that responsibility could not be fixed. Four divisions of the company were therefore made, sales, purchasing, and production, manufacturing and accounting, and financing. Budget control brought great reduction in spoilage. Some results of the system were as follows: Ratio of non-productive expense labor to direct labor has been reduced. More efficient utilization of labor has made possible a saving of $40,000 in production of same volume of goods. Maximum and minimum points have been determined for amount of raw materials needed for efficient operation."—*Division of Simplified Practice Bulletin; Department of Commerce.*

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Part of an Installation of Dracco Filters in World's Largest Foundry

Profits in Dust— DRACCO recovers them

In a vast number of plants flying dust means lost profits. The Dracco method of dust and fume recovery collects the values from these—turns losses into profits.

Dracco is an engineered method for recovering the values that would ordinarily be lost in your plant. Dracco engineers will study your problem, specify equipment, and see that it is properly installed.

Dracco has been known in some cases to recover 100% of all values and guarantees to get better than 99% of them. In operation it is fully automatic, material being collected in base of filter ready for further handling.

We will be pleased to help you solve the dust and fume problem in your plant. Write for catalog which contains a form which will give us necessary data to make an estimate. Or we will send an engineer upon request.

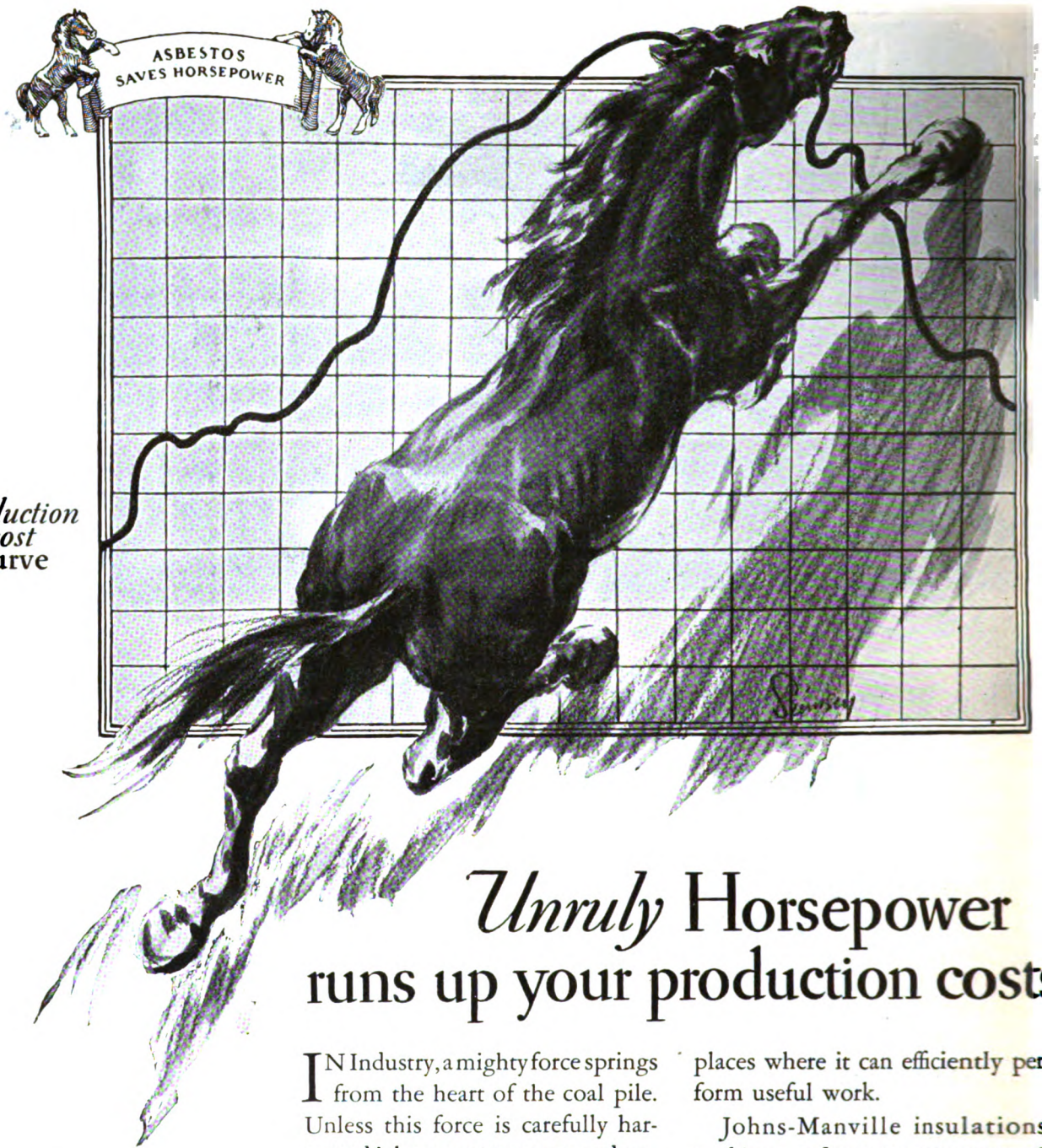
The Dust Recovering & Conveying Co.

Engineers and Manufacturers

CLEVELAND, OHIO

DRACCO DOES IT

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Production cost curve

Unruly Horsepower runs up your production costs

IN Industry, a mighty force springs from the heart of the coal pile. Unless this force is carefully harnessed it becomes rampant and unruly. It breaks away from useful work and escapes from the engines of Industry. Fuel is wasted . . . up goes the cost curve.

To restrain unruly horsepower is the function of Johns-Manville products of Asbestos. They hold it in check, they guide it to the places where it can efficiently perform useful work.

Johns-Manville insulations, packings, refractory cements, all serve industry and the entire nation by taming unruly horsepower.

Let a Johns-Manville power specialist go over your plant to suggest means by which the products of asbestos can keep your horsepower within the traces and bring down your cost of production.

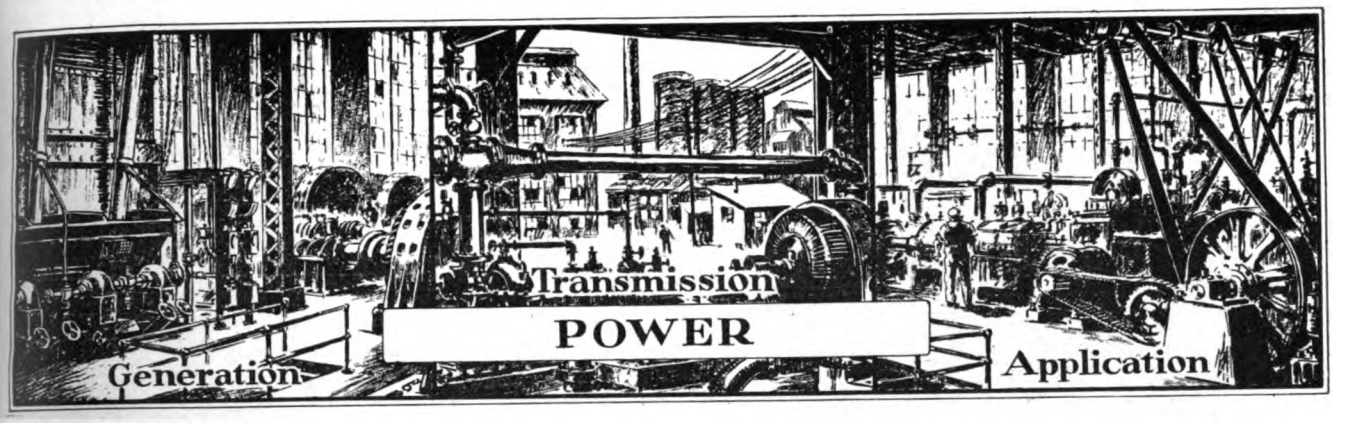
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INSULATION
BRAKE LININGS
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Buy Power Equipment Which Has Been Tried Out

By W. F. Schaphorst, M.E.

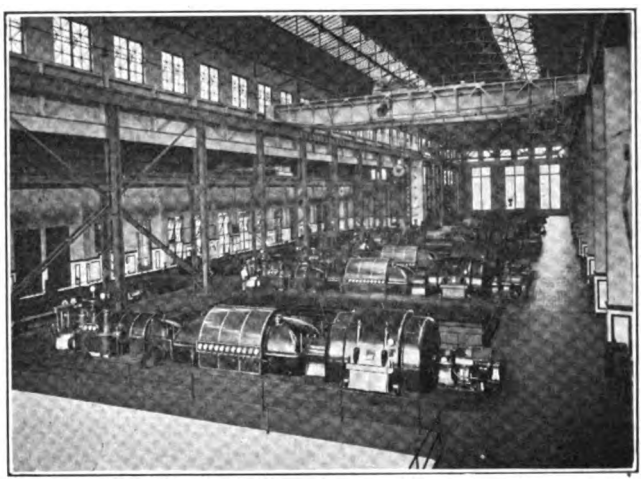
Let Someone Else Do the Experimenting

AN excellent rule for every reader to remember and apply is this: "Don't buy any engine or machine that has not passed through the experimental stage."

Aldermen of small towns and cities are too often the easy prey of untried equipment. In their well-meant endeavor to do the best thing for their fellow citizens they buy something "new"—something that is "far superior to anything else"—according to the statements of the manufacturer's salesman.

As I write this I am in a small city in one of the middle states in which a complete change of aldermen is made every few years by ballot. These aldermen have sole power in the buying of equipment. To *Save Money* for the city they do not employ an experienced and unbiased consulting engineer to tell them what is best for them. They do the selecting themselves.

The result is that the present power plant is a conglomeration of nearly everything. Some of the equipment is all right, but much of it is not all right. They have three different kinds of engines at the present time, and two of them have given considerable trouble. I am sure every reader of INDUSTRY ILLUSTRATED has heard of the engine that has not given trouble. The oldest is now being removed to make room for a new engine of a rare species. I have heard of the engine myself, and I know that a few have been sold, but I am sure it has not yet passed through the experimental stage.



Here is a type of power equipment which has passed from the experimental stage to that of complete acceptance as efficient generating units. These two stage turbo generators are in the plant of the Newport Power Company.

Had I been employed as consultant by this town I believe I would have recommended a non-condensing steam turbine of well known make, the exhaust to be used for heating.

Today I was informed that the aldermen of a neighboring town out here signed a contract for a new engine. When they were told by the salesman that this town uses that type of engine they were convinced that it must be a good one. Then, after signing, they came over to see the engine and make inquiries. I do not know what they did after being told that the engine is not satisfactory, but, anyway, all investigating should have been done *before* buying and not after.

"Well," I have been asked, "how can I be sure that an engine or device has passed through the experimental stage?"

One good method is to look into the advertising record of the company. If the company has been a consistent advertiser for a number of years, that is a pretty reliable indication that the machine is first class. No inferior product has ever been advertised regularly for many years. In time, the poor products always fail while the best ones bring in enough profit so that they can continue to exist and be improved.

First class concerns do not put products on the market that have not passed through the experimental stage. If it is a new product and the manufacturer is not certain that it will not prove satisfactory the reliable manufac-

(*See next page*)

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WITT CANS

are built for rough usage

The unusual demands of the industrial field are kept in mind when manufacturing Witt Corrugated Cans.

As containers for small parts, liquids, rubbish, etc., where rugged construction is essential, they stand the gaff. Made of special analysis sheet steel, solid beaded one-piece steel bands top and bottom, deep, well-rounded corrugations, body and bottom interlocked, riveted and electrically welded, they make good their guarantee to outlast three ordinary cans.

Witt Corrugated Cans are used in some of the largest industrial plants in the country. You, too, will want them as standard equipment after a trial order. Phone your supply house, or write

THE WITT CORNICE COMPANY
2117 Winchell Avenue
Cincinnati, Ohio

Manufacturers of

WITT
CORRUGATED
•CANS and PAILS•

turer will make good any deficiency either in money or in a new machine.

A number of years ago I was in the employ of a new and unreliable manufacturer. Many concerns that should have known better lost considerable money by purchasing the product of my company. Everybody lost, including my company. The company failed because its product was not as efficient or economical as that of competing companies. Its advertising campaign lasted for only a few months.

The preferable method, where much money is involved, is to employ an experienced consulting engineer. The above concern that failed did not once succeed in selling its product to a consulting engineer.

Quick Action Coupling Simplifies Drive Changes

MANY kinds of modern equipment require a quick disconnecting flexible coupling on the driving shaft to facilitate quick changes in hook-up, or to allow for using one motor to drive different machines at different times.

A new flexible coupling is made so that the flange attached to the driven shaft is readily removable. The removable half is made with an extended split hub on the driving flange, the hub being tapered on the outside and threaded over one half its length, closest the flange. A collar—made to fit over the threaded hub—screws up to a tension fit—tightening the hub to the shaft, being further held in place by set screws, fitted over two sliding keys.

This type of coupling can be connected or disconnected in a very few minutes, the only tools required being a pipe and set screw wrench.

Flexible couplings of this kind find an ideal application on Fourdriniers and other paper mill machinery, grinding and stone finishing machinery, lumber mill equipment, hot metal molding machines, and process machines in general as they are time and labor savers, absorb shock and overload, allow free end float to motor shafts, and are an insurance against undue wear on bearings and motor armature.

Fractional Horse Power Motors Oiled Once a Year

AN interesting type of small motor has recently been announced. It is built in the single phase, repulsion-induction type, 2 or 3-phase squirrel cage induction type, and direct current compound-wound type in sizes ⅛ to 1 hp. inclusive.

The lubrication system employed has the advantages of a large oil and wick reservoir with sufficient oil capacity for one year's operation without reoiling, the use of long wicks with great filtering and absorption capacity, and a positive means to insure the circulation of filtered oil to the shaft at all times.

Other refinements that have been made in this type of motor consist of a very compact design, a reversing arm which makes it easy to change the direction of rotation, thoroughly enclosed frame affording full protection to the windings, nickel plated trimmings and a pleasing appearance throughout.

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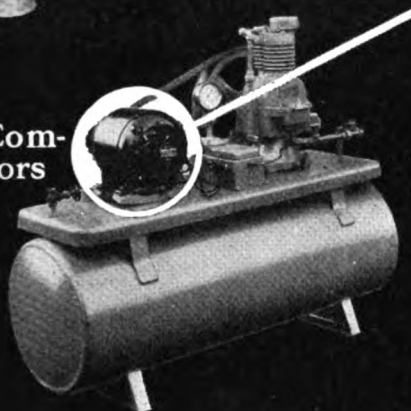
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The Ring of Satisfaction a MASTER MOTOR

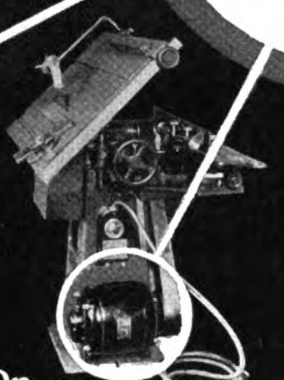


On Paint Spraying Equipment

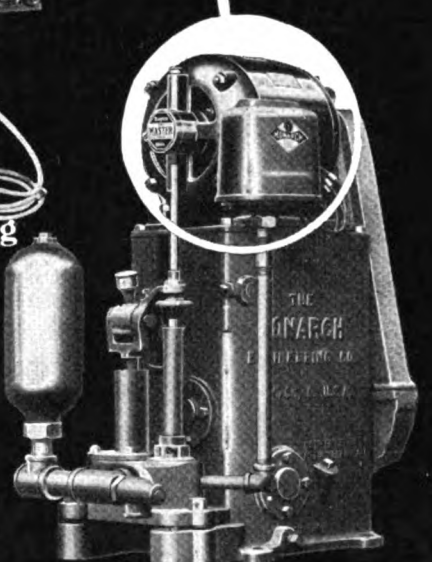




On Air Compressors



On Woodworking Machinery



On Pumps of All Kinds

Satisfaction counts. Nothing satisfies like dependable performance. Promises—prices—prestige—all fade away if the motor does not spin along quietly, day in and day out. Manufacturers who use Master Motors have proved to their satisfaction that Master performance pays.

THE MASTER ELECTRIC COMPANY
Linden and Master Avenues
Dayton, Ohio

STOCKS CARRIED IN PRINCIPAL CITIES

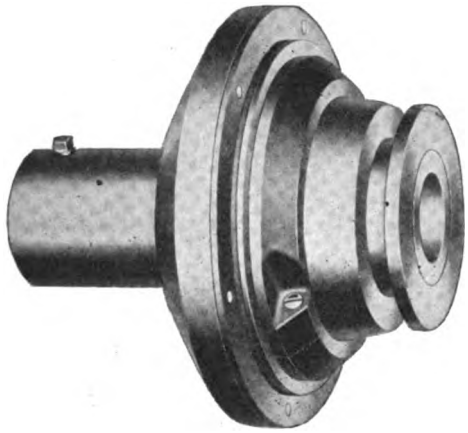
MASTER GUARANTEED MOTORS

1/8 TO 7½ H.P.

Dayton THE MASTER ELECTRIC CO Ohio.

Less than 40°

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HERE IT IS:

The New Conway Disc Clutch is

Entirely enclosed,
Inherently Balanced,
Has Under-Slung levers,
Large lever ratio,
Accessible, accurate adjustment,
Easy engagement, instant release,
Drag free idling,
Helped instead of hindered by centrifugal force,
Steel Discs,
Chrome-nickel forged levers,
full length bearing for loose member.

An honest to goodness improvement in Disc Clutches. Try one!

THE CONWAY CLUTCH CO.
1960 Riverside **Cincinnati, Ohio**

Laces Eight Inch Belt in Ninety Seconds

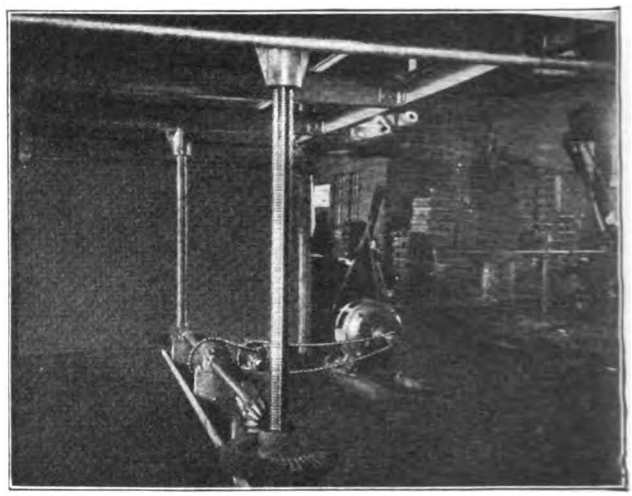
A THREE quarter turn of the crank of a newly introduced belt lacer and the powerful jaws of this machine force a row of hooks cleanly and uniformly into an eight-inch belt.

A pressure of 45,900 pounds on the belt is developed by an entirely new principle, embedding the hooks in perfect alignment, flush with the surface, thus prolonging the life of the joint and reducing the wear on pulleys to a minimum. The smallest belt may be laced with it with increased speed and economy.

The makers further report that they have now more than 225,000 belt lacers in use and their daily output of belt hooks exceeds 4,000,000. Only the most modern machinery makes it possible for the company to keep up with the ever-increasing demand.

Roller Chain Used on Improved Lumber Lift

WHEN the owners of the plant illustrated redesigned and improved their two-screw lumber lift to provide still further accuracy, the problem of precise drive presented new difficulties. The problem was solved



Roller Chain Drive for National 2-Screw Lumber Lift

as shown in the accompanying photo. The travel of the lift varies from 6 to 20 feet and extreme accuracy in leveling is essential at all times. From the 15 hp. 870 r.p.m. motor to the shaft, there is a double strand roller chain, ¾ in. pitch; and a single strand roller chain, 1 in. pitch, drives the lift shaft, thus insuring positive driving with the maintenance of a consistent speed ratio, both of which are essential to the correct operation of the lift.

Smallest Across-the-Line Starter for 5 H.P. A.C. Motors

"NO larger than a telephone box" is the way a new starter is described by the makers.

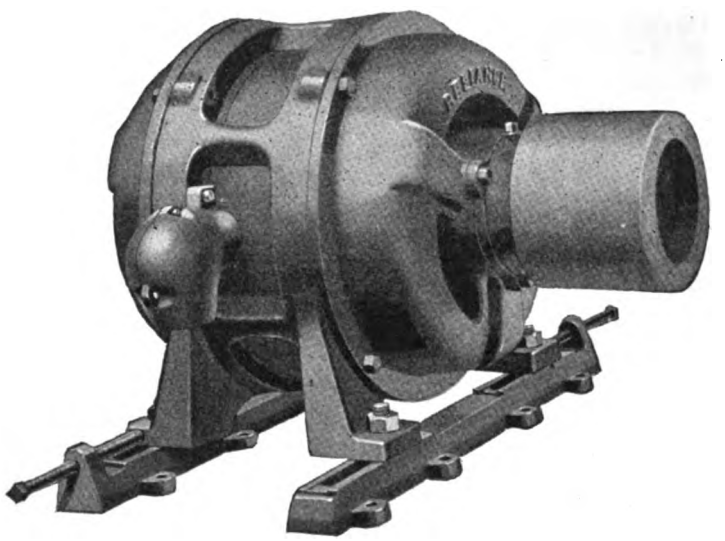
It handles motors of 5 hp. and under, gives push-button control of starting and stopping, provides Thermal Overload Protection and No-Voltage Protection.

(*Continued on page 98*)

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Buy this motor~ *and junk the OIL CAN!*



The oil can and its contents though essential to the ordinary motor are two of its worst enemies. Too much oil carelessly directed causes oil-soaked windings and costly breakdowns.

With Reliance Ball-bearing Motors on the job you can cut out the danger and cut down the cost at the same time. In place of frequent oil squirting apply a little grease once a year. The grease is easily put where it belongs and can be kept there. Breakdowns due to oil-soaked windings are at an end.

The Reliance ball-bearing motor construction is backed by 21 years of experience in applying anti-friction bearings to electric motors.

RELIANCE ELECTRIC & ENGINEERING CO.
1048 Ivanhoe Road, Cleveland, Ohio

Branches: Boston, New York, Buffalo, Pittsburgh, Philadelphia, Birmingham, Cincinnati, Detroit, Chicago

RELIANCE A-C D-C MOTORS with Ball Bearings

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"So I said, 'I'm from Missouri,' and I made them prove Sarco saving"

"You know me, Bill, I've got to be shown! There's been one of those SARCO salesmen coming in here for months, trying to sell me some of those steam traps. He had it all figured out, but you know anything can look good on paper.

"Well, he came in again about two months ago with his usual story of how this self-adjusting Sarco Steam Trap would do the same work of the big traps at a third the cost and save a lot of coal, so finally I said:

"'Mister, I'm from Missouri. If you're so sure those traps will cut down our fuel bill, put 'em in on demonstration!'

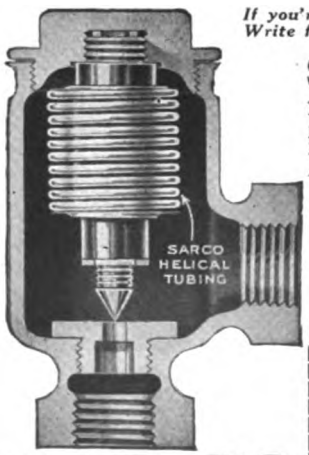
"'You're on,' he answered, and I gave him a 30-day FREE trial order.

"When they came in and I saw how small they were, and that there wasn't any bucket, or float, or valves or the other usual parts, I decided not to bother to hook 'em up. But Mike said, 'Why not try 'em anyway, so long as it's no work to just screw them into the line.' So I told him to go ahead."

"How'd they work out, Jack?"

"Why they gave me the surprise of my life. They worked OK and we kept a careful check on the coal used and they paid for themselves inside of six weeks as near as we can figure. They showed me, all right. If you haven't got them it will pay you to investigate."

If you're from Missouri, we'll show you, too. Write for Booklet R-286 or mail the coupon.



SARCO CO., Inc.

183 Madison Avenue, New York

Boston Chicago Detroit
Buffalo Cleveland Philadelphia

Adolf Frese Corp., 726 So. Hope St., Los Angeles

Peacock Bros., Ltd., Montreal

30-Day Free Trial Coupon

SARCO CO., Inc.
183 Madison Ave., New York City

Kindly send me ..... ½-in., ¾-in., 1-in., Sarco Steam Trap for a 30-DAY FREE TRIAL. If it does not prove its value it is understood that I may return it without cost or obligation.

Name .....

Address .....

City .....

SARCO STEAM TRAP

(*Continued from page 96*)

The starter is provided with push-buttons in the front cover of the case. The small size in most cases permits mounting of the starter where the control station would ordinarily be placed and the extra wiring and cost of a push-button station is thus saved. However, one or more push-button stations may be used if desired.

A novel feature is the type of contactor developed for use in this starter. A roller is forced between two fingers to complete the circuit. Thus a double break, and a wiping contract, are secured. This arrangement reduces arcing to a negligible minimum.

To adapt the starter for any horsepower within rating it is only necessary to insert the proper size heater coils in the Thermal Overload Relay.

The starter can be furnished to machinery builders, without the case for incorporation in machinery design as standard equipment.

New Cementing Material on Fire-brick Resists Fluing in Furnaces

IN metal-melting and heating furnaces, boiler furnaces, cement and lime kilns and other refractory structures, the highly heated brickwork is subject to the corrosive action of fuel ash and furnace products containing iron oxide, lime, magnesia, alkalies, etc. These basic oxides attack the siliceous fire-brick and flux away their surfaces at temperatures far below the true softening point of the fire brick.

To resist this fluxing action and to prolong the life of fire clay brickwork, fire clay brick may be laid up in a newly introduced neutral material, with a chrome base cement free of silicate of soda and other acid fluxes. It is exceptionally plastic and readily lends itself to either dipped or trowelled joints. Its softening point lies between 3,400 and 3,500 degrees F. After the fire brick has been laid up with it the exposed surface of the brickwork should be covered with a plaster coating of the same, either by troweling or cement gun. Owing to its non-shrinking characteristics and ability to adhere to brickwork, it forms a working surface of chrome refractory which protects the brick against the fluxing action of basic substances and materially prolongs the life of the brickwork.

Refractory structures such as electric furnaces, combustion chambers in oil, gas and powdered coal installations, coal gas retorts, etc., which are subject to rapid failure can be effectively repaired and kept in continuous operation by patching with the material, which is either rammed in place or, preferably, applied with a cement gun.

THE coal buyer who is keeping his eye on all developments is maintaining his stocks on hand and purchasing for his current needs, with the knowledge that he can make as good a bargain now as will be possible within the next several months, and the further thought that he will have enough coal on hand to last him over a stampede period.

It will cost as much now to handle the reserve stocks from storage to boiler as it will a year from now. The only extra cost in keeping them in reserve is the interest on the investment but the well informed buyer will realize that the interest on the investment in coal stocks is a small premium for the insurance of sufficient stocks of coal in time of need. —*National Ass'n Purchasing Agents*

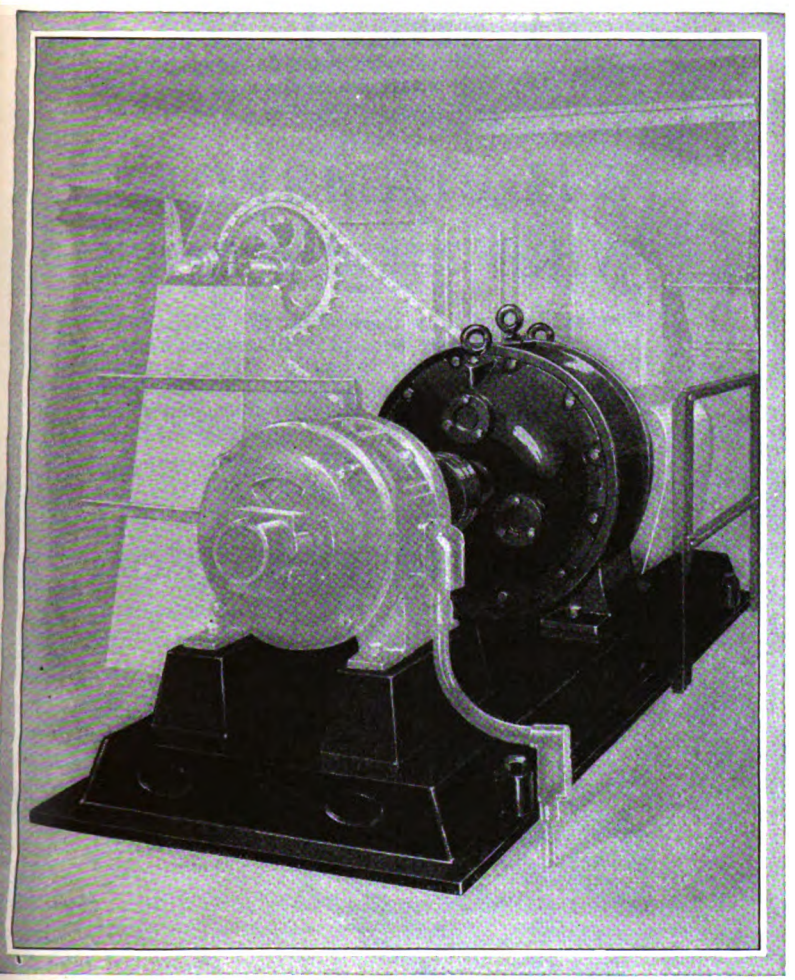
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GREATER POWER EFFICIENCY

Longer Life

Less Upkeep



Note how compact and secure this Jones Speed Reducer installation is with the motor and speed reducer mounted on the same base. Correct alignment is assured between motor shaft and high speed reducer shaft.

The necessary reduction in motor speed is obtained in very small space with practically no power loss. Power is transmitted to the driving chain on a balanced straight line. The gears inside the dust-proof reducer housing operate in a constant oil bath under ideal conditions. Friction is eliminated insofar as possible. No attention is required beyond occasionally replenishing the oil supply.

Here, as in numerous other instances, steady economical production is maintained. In mills, mines and factories Jones Speed Reducers are giving this same consistent, trouble-free service. They are driving conveyors, elevators, stokers, agitators, water screens, gas producers, dry-kilns—in short, wherever electric motors are used to drive slower moving machines.

For full information regarding the application of speed reducers to your particular drive problem, write us direct or the office nearest you. We shall be glad of the opportunity to help you. Our Reducer Catalogue Number 26 may prove useful to you. If you do not have a copy, send for it.

Jones Speed Reducers

W. A. JONES FOUNDRY & MACHINE COMPANY

Main Office and Works: 4412 West Roosevelt Road, Chicago

Branch Sales and Engineering Offices:

New York Cleveland Milwaukee Pittsburgh Buffalo Detroit
Birmingham St. Louis Cincinnati Peoria Los Angies San Francisco

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When you gamble on wire rope Trouble always holds the ace



With certainty in the quality of wire rope so easily obtainable, some men still buy wire rope on a gamble—and those men are flirting with trouble. They are unfair to their machinery—they are jeopardizing the safety of their workers. Have *you* ever thought of this?

When *you* purchase wire rope do you know its grade; have you exact knowledge of its tensile strength—its working limitations? You can say "Yes," if it's

WILLIAMSPORT WIRE Telfax Tape Marked Factory Certified ROPE

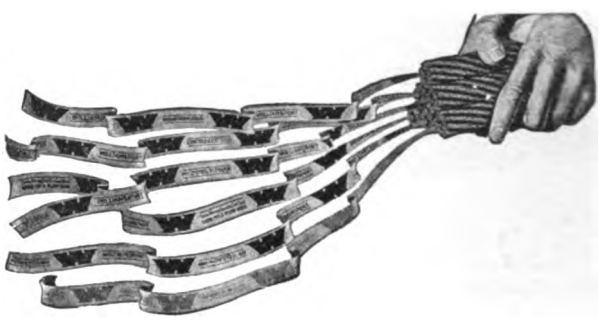
The grade is plainly marked on the Telfax Tape running through the core of Williamsport rope, a permanent record during its life. This certainty costs you nothing, yet it is priceless to you for it removes you from the shadow of uncertainty and possible troubles.

Why gamble—why not be safe? Specify Williamsport.

WILLIAMSPORT WIRE ROPE CO.

Main Office and Works: Williamsport, Penna.

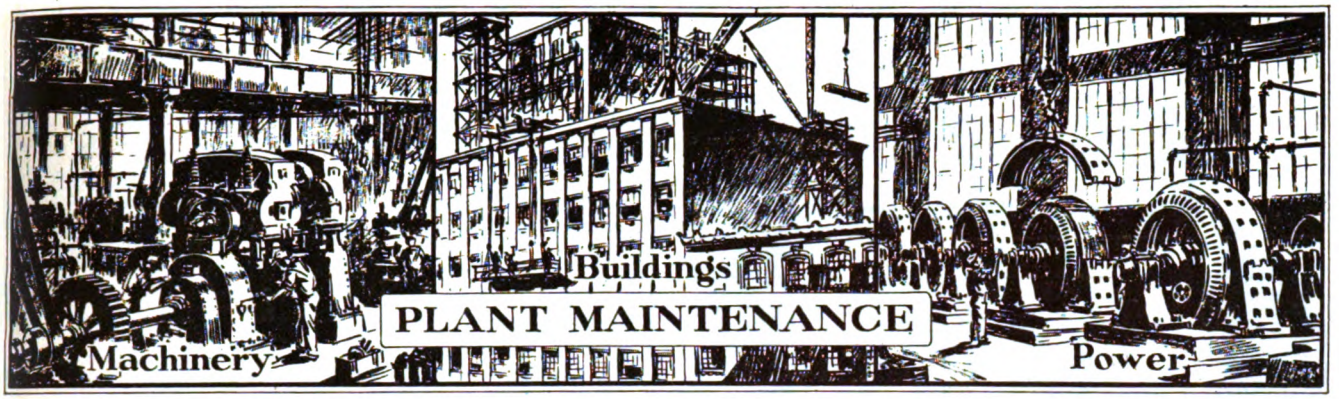
Gen'l Sales Offices: Peoples Gas Bldg., Chicago



WILLIAMSPORT CERTIFIED WIRE ROPE

Use Madesco Tackle Blocks. They Stand the Gaff

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Get the Plant in Shape for the Winter

By C. Stanley Taylor

THE small precautions that save a call from headquarters and a deal of extra labor in cold weather can well be taken now by preparing the plant for the winter season. An inspection of the buildings and all their appurtenances at this time may uncover incipient trouble that can be forestalled with little effort which might otherwise interfere with production at a busy time later on.

Here is just a brief check list as a memory jogger for the plant superintendent and his maintenance assistants:

Beginning at the roof, every sign of moisture showing through after the heavy summer rains should be checked up and worn places or leaks repaired. Drain inlets probably need cleaning out, flashings should be inspected, skylight glass replaced where cracked or broken, ventilators oiled (if of the revolving type), guy wires tightened, and possibly some exposed metal work touched up with paint where rust stains are showing.

Windows throughout the plant should be inspected for breakage and replacements made; possibly the sash painted, and the sash operating devices adjusted to make certain all sash close tightly to prevent heat loss. If a regular window washing schedule is not maintained, at least clean them once this fall before the dark days of winter. While the outriggers are in place for the window washers' platforms or bos'ns' chairs, it might be well for a mason to caulk around the sash and to point up brickwork or to patch the exposed reinforced concrete work where mortar has crumbled or cement has spalled away from the reinforcement rods. All of this is a lot cheaper in mild fall weather than in the dead of winter.

Inside the plant the heating system comes to mind at first. Idle boilers need attention before firing up; unit heater motors should be oiled and cleaned; valves repacked where leaks occurred last season, and the whole system thoroughly inspected and put in first class condition.

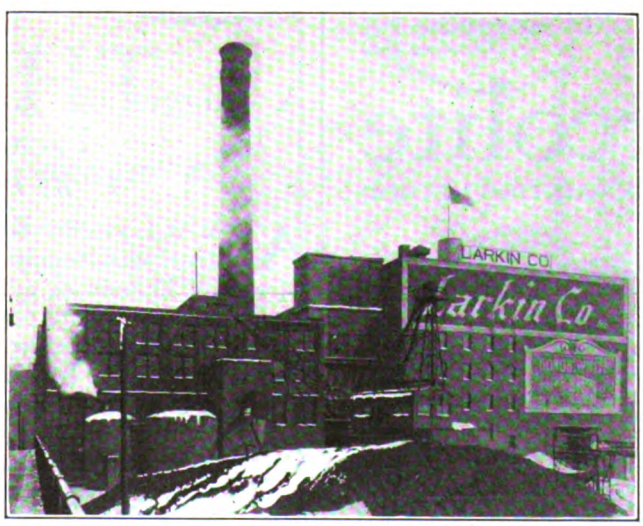
The sprinkler system possibly needs attention. The tank heater may have been forgotten for several years as well as the covering of the tank feeder and main pipes. Little attention is necessary generally, but a freeze-up would be serious. Sprinkler lines extending into unheated buildings may need a little more calcium solution. While this system is being attended do not overlook the fire pails; the recharging of hand chemical extinguishers and inspection of the fire hose, pumps, and all the other protective equipment.

The lighting system is beginning to get its heaviest load right now. Bulb replacements and a thorough cleaning of reflectors will restore the 40% or greater loss in illuminating intensity which quickly comes with a little neglect, and will improve production and save on the lighting bill.

The plumbing and drinking water systems are in such constant use there is little necessary to be done for winter preparation. Possibly, however, you replaced a frozen pipe somewhere last winter that you didn't have time to insulate against further trouble; in which case an hour's work now will save a half day or more some time in February.

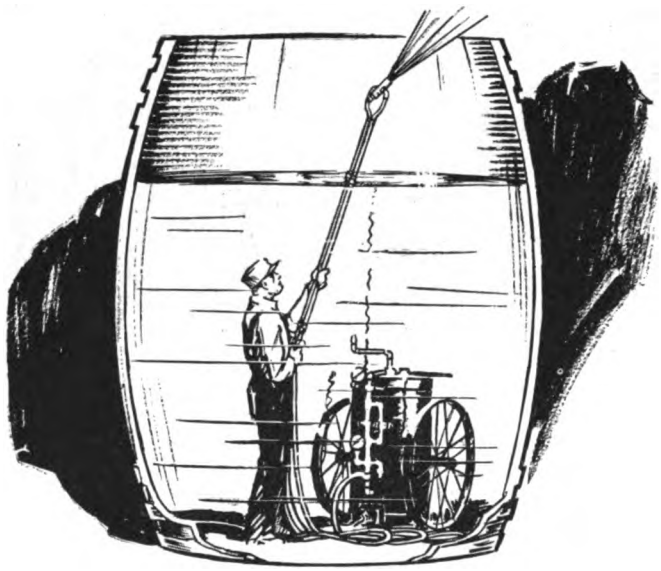
The power plant may need special attention, but the preparations necessary for the winter are extensive enough to call for later special mention.

Out on the grounds a general clean-up is in order. Roads and walks may need patching and resurfacing, and the soft spots where a truck got mired last spring should have a new sub-base while there is still time. If your plant is in the country be sure leaves are cleaned out of culverts and drains.



Don't wait until this time comes before making repairs to your buildings and equipment; it is much less expensive to do it now.

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NOT merely the lasting service of a superfine paint, but the preliminary service of getting the paint where you want it—on the wall.

With the purchase of Vorcolite comes the use, without cost, of our big, speedy Vortex painting equipment, that any handy man can operate and cut painting costs to the minimum.

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Vorcolite is so rightly pigmented that a single application with our equipment equals two or three brush-applied coats of ordinary paint. Send today for check sheet which helps you to estimate painting on a square foot basis.

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and the VORTEX PAINTING METHOD



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West 77th St., Cleveland, Ohio
Please send us check sheet to outline our painting problem. It is on new construction? _____ Buildings already in use? _____
Company .....
Address .....
Attention .....

V-37

How to Protect New Cement Floors

MANY a fine concrete floor, that was perfect when the finishers completed their troweling, has been irreparably damaged before the building was ready for occupancy, because of improper protection to the surface during the curing period. Lack of effective protection has constituted a serious handicap particularly in the case of factory concrete floors.

Modern construction practice unfortunately subjects floors to unusually severe usage during the curing period when they are least able to withstand it. Painters, millwrights and other trades move across and work over the new surface and on it each trade usually leaves its indelible marks, often seriously injuring the floor. To prevent this damage, sand, sawdust and building paper coverings have proven insufficient and it was to provide a dependable means of safeguarding the owner's investment in floors that a new protective compound has been developed.

It is a jelly-like material specially prepared for application to new cement surfaces. Applied to the surface in a paint-like film 36 hours after the final troweling, it dries to form a non-porous, viscous film through which paint, oil, grease, tobacco juice and similar staining agents cannot penetrate. This film is so tough that the heavy traffic new floors have to bear cannot grind through it to leave its marks in the cement beneath.

Over this film, the mechanics complete their work. Equipment is moved in and set up. Workmen pass back and forth until the building is completed.

Then when the building is ready for occupancy, the film is removed, leaving the floor as perfect as when it was laid.

Meanwhile, proper curing has been insured by the stainproof film which seals the original moisture in the topping, allowing slow and proper crystallization of the cement, and which prevents too quick drying, the result of which is usually a weaker wearing surface. In preventing evaporation, the stainproof film achieves two important results:

It prevents efflorescence and reduces crazing or hair checking to the minimum. Experts maintain that both efflorescence and crazing are the results, direct or indirect, of rapid evaporation of moisture from the cement mortar. By preventing this rapid evaporation, these two characteristic cement troubles are practically eliminated.

A Suggestion for Floodlighting the Factory Yard

By D. R. Lane

A SMALL gasoline engine-generator set, mounted on a truck and supplying current to two floodlights, effectually illuminates a western air field, where mail planes occasionally are compelled to land by night. The entire set was assembled at the field by the airplane mechanics and cost less than $500.

Two small trucks were first constructed of ordinary lumber, the wheels from an old light car being used. Six-inch flat tires made of strap iron were welded on the rims to prevent the trucks from sinking into the sandy soil. The engine, generator and one light then were mounted on one truck, enclosed to prevent sand from

(*Continued on page* 104)

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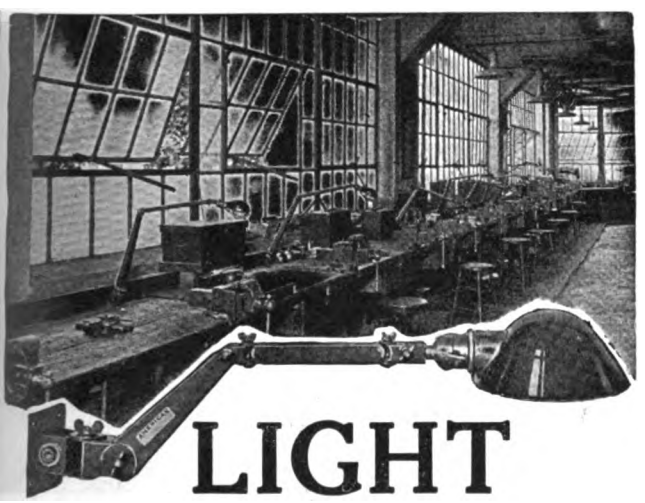
A New Safety Goggle for Your Workmen Who Wear Glasses

You know how hard it has been to get a safety goggle which workmen can wear over their spectacles.—But those days are past.

We offer you a Willson Adjustable Goggle built to wear over the various kinds of prescription spectacles. This new safety goggle is convenient to wear, fits comfortably on any face, and costs but $16.20 per dozen, f. o. b. Reading, Pa., U. S. A.

Don't postpone your inquiry. Just refer to Willson Goggle No. M123L, and learn more about the new economy.

WILLSON GOGGLES, INC., READING, PA.



LIGHT

Steady—without danger of Eye-Strain—

The best light for your workrooms is the kind that can be directed constantly on the work. American Adjustable Fixtures are just like that. No shadows. Light always where it is needed most, and used only when needed by each worker.
Let us tell you why your workbenches, machines, etc., should have the aid of American Fixtures. Write for information.

American Fixture Company
230 West Water Street
MILWAUKEE WISCONSIN



DIXON'S Silica-Graphite Paint

1827-1927 100th Anniversary

When you paint for *protection* look for three things

1. Water-tightness
2. Air-tightness
3. Permanence

Then consider the reasons why Dixon's Silica-Graphite Paint possesses these characteristics in the highest degree.

To start with, the very nature of graphite makes it water resistant. Water slips off a graphite film as surely as off a duck's back.

This silica-graphite coating is airtight because the natural flat scales of this pigment overlap to form an unbroken skin.

And during the more than 65 years this paint has been on the market many records have been received where the protective coating was still effective after even 10 or 12 years.

Write for Booklet 61-B and Color Card

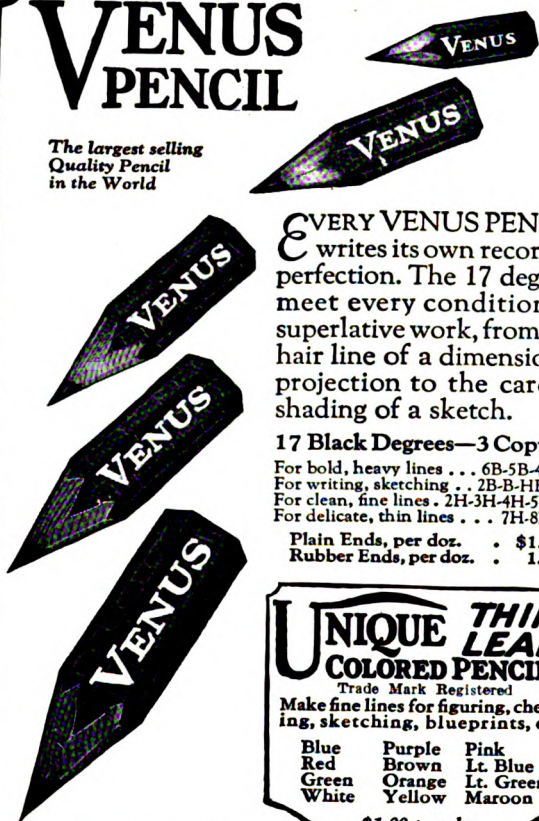
JOSEPH DIXON CRUCIBLE CO.
Jersey City, N. J.



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17 Black Degrees—3 Copying

For bold, heavy lines . . . 6B-5B-4B-3B
For writing, sketching . . 2B-B-HB-F-H
For clean, fine lines . 2H-3H-4H-5H-6H
For delicate, thin lines . . . 7H-8H-9H

Plain Ends, per doz. . $1.00
Rubber Ends, per doz. . 1.20

UNIQUE THIN LEAD COLORED PENCILS
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Make fine lines for figuring, checking, sketching, blueprints, etc.

Blue	Purple	Pink
Red	Brown	Lt. Blue
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White	Yellow	Maroon

$1.00 per doz.

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224 Fifth Avenue New York

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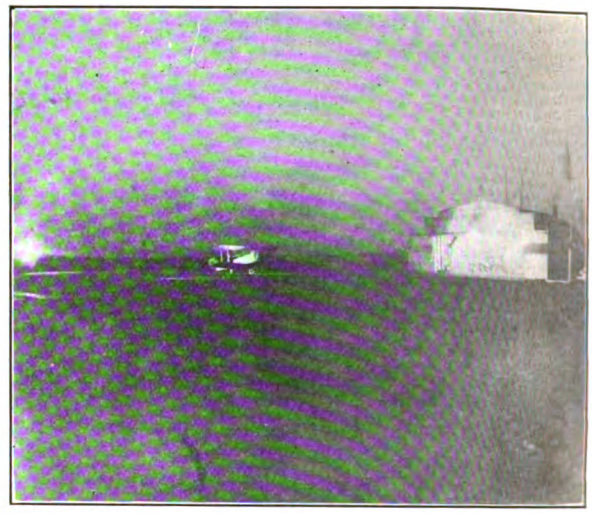
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Hawthorne Station Chicago

287 STYLES AND SIZES

(*Continued from page* 102)

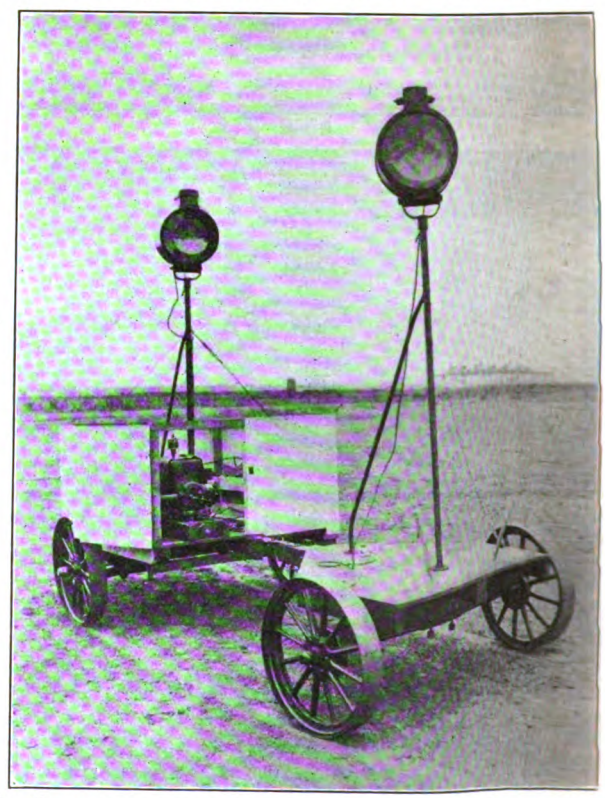
getting into the machinery, and the other light and a reel for holding the power cable mounted on the other.

The engine is a 1½ horsepower motor of ordinary de-



Mailplane landing on western airport at night by light of two small portable floodlights.

sign, obtained from a dealer. The generator is a 40-volt affair, only putting 32 volts into the 16 two-volt storage batteries connected into the circuit, however. The lights are 300-watt projector lamps mounted in 1000-watt flood-



Small portable floodlights used at a western airport where mailplanes occasionally must land after nightfall.

light fixtures, which in turn are carried on light standards.

In practice, the trucks are towed by a light car or truck to the end of the field and set up about 300 feet apart, faced so that they send their beams down the field in the opposite direction to that the wind is traveling. The pilots come in over the lights and land on the illuminated belt. The fliers say the lights provide plenty of light for landing. The cost of operating them is trivial.

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YEAR after year, building walls must fight the weather. Without protection, they are worn down by the elements. Penetrated by moisture. Marred by discolorations.

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A Review of Publications Received

By Reginald Gordon

THE Asbestos Shingle, Slate and Sheathing Company, Ambler, Pa., have issued a catalogue of asbestos materials of interest to factory managers. Roof coverings made of asbestos fibres embedded in hydraulic cement and consolidated into a homogeneous material under high pressure are claimed to be fireproof and indefinitely resistant to all climatic changes.

Asbestos corrugated roofing and siding is an excellent material for factory buildings and does not require painting. The Company manufactures also ebonized asbestos lumber impregnated with a special compound that renders it impervious to moisture and gives a high dielectric strength, thus making it available as a material for switchboards, outlet boxes, etc.

* * * * *

The Fairfield Engineering Co., Marion, Ohio, have recently sent out Bulletin No. 65, describing their portable belt conveyors. These machines are substantially built, mounted on a pair of roller-bearing steel wheels and have a hoisting device operated by a crank and provided with an automatic locking dog. The rubber conveying belt is built up with extra heavy material on the carrying side and runs over specially designed idlers. For driving power, either an electric motor or a gasoline engine can be used. In the former case, the motor is mounted under the belt frame with a steel cover to protect it from dust and falling material.

* * * * *

Stephens-Adamson Mfg. Co., Aurora, Ill., have issued a bulletin on a variable speed transmission, a machine that can be direct connected to any electric motor and thereby reduce the speed of the latter through a wide range. The device is controlled through a hand wheel and the roller bearings are submerged in oil. With a type R reducer, a motor running at 1,200 r.p.m. furnishes power to the low speed shaft through the medium of the reducer at any speed from 750 to 150 r.p.m.

* * * * *

Richards-Wilcox Manufacturing Company, Aurora, Ill., is sending out a 4 page pamphlet describing their OverWay steelbeam conveying and hoist units. Of either 1,000 or 2,000 lb. capacity, this equipment is adapted to use in machine shops, garages, warehouses, etc.

The trolley track is also built with switches and a swivel carrier for operating on curves. Either Yale, Wright or Herrington chain blocks may be used on the hoist.

* * * * *

Folder Form No. 652 has reached us from the Century Electric Company, St. Louis, Mo. It shows the assembly of Century repulsion-start, induction, single-phase motors. The arrangement of bearing bracket and brush holders, armature, governor, lubrication system, etc., is clearly shown in the illustrations.

* * * * *

Climax Engineering Company, Clinton, Iowa, have recently published a series of booklets giving price lists and instructions for operating their models R6U, R4U and TU engines. Copies may be had [illegible]st from users of Climax engines.

Dean Hill Pump Co., Anderson, Ind., has issued Bulletin No. 1202, on Wait Type Steam turbines. These turbines are adapted to the present-day requirements of high pressure and high temperature steam. They are so designed that the only parts subjected to high pressure steam are the throttle valve and valve body, the nozzle and nozzle stand and the emergency butterfly valve. These parts are made of Monel metal or cast steel.

* * * * *

Chain Belt Company, Milwaukee, Wis., has sent us Catalog No. 220 on chains and transmission equipment. It is a 140 page pamphlet with illustrated description of the many types of chain made by the company, sprocket wheels as well as spur and bevel gearing, worm gearing, couplings and clutches, pillow blocks, elevator buckets, etc. Price lists of all these are included as effective July 1, 1927. Very complete tables of data relating to the product are also included.

* * * * *

The Westinghouse Electric and Manufacturing Company have recently sent out a circular, 1579-E, devoted to Micarta gears and pinions. Micarta gears are now in use by many manufacturers in place of cast-iron, untreated steel and bronze gears on account of their silent and efficient operation. The most recent authoritative data and technical information on Micarta gears are given in this publication. New formula and tables, the recommended practice of the American Gear Manufacturers' Association are also included.

* * * * *

Leitelt Iron Works, Grand Rapids, Mich., manufacturers of elevators, lumber lifts and special machinery have sent out several bulletins descriptive of their product.

The lumber lifts are used for stocking and feeding lumber from the dry kilns to the cut-off saw, rip saw, edger or planer with a minimum amount of labor. The boards are fed vertically to a height convenient for the operator, who can stop the lift at any level, according to the height of the saw or planer table. A kiln load of lumber can be brought up to a machine without rehandling and in addition to the avoidance of congestion at the various machines the payroll is reduced and a man can work with less fatigue, because he is not obliged to do any vertical lifting.

* * * * *

The Webster Mfg. Co., Chicago, have issued Catalogue No. 50, which gives descriptions, sizes, capacities and much other data relating to the chains and sprockets made by them. The Catalogue quotes prices as of July 1, 1927.

* * * * *

The Mississippi Wire Glass Company have published "Making Daylight Better," an illustrated booklet calling attention to the six leading styles of glass manufactured by them. Each one of these has its specific application in factory or office buildings. Mississippi-Aurora, Factrolite, Syenite Polished, Pentecor and Ayex comprise the group.

(*Continued on page* 108)

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Saves Cable Renewals

Wherever electric machines *move*—Reelite *saves!*

1. Saves wear and tear on the cable that feeds current and thus saves its cost (often in as little as a year).

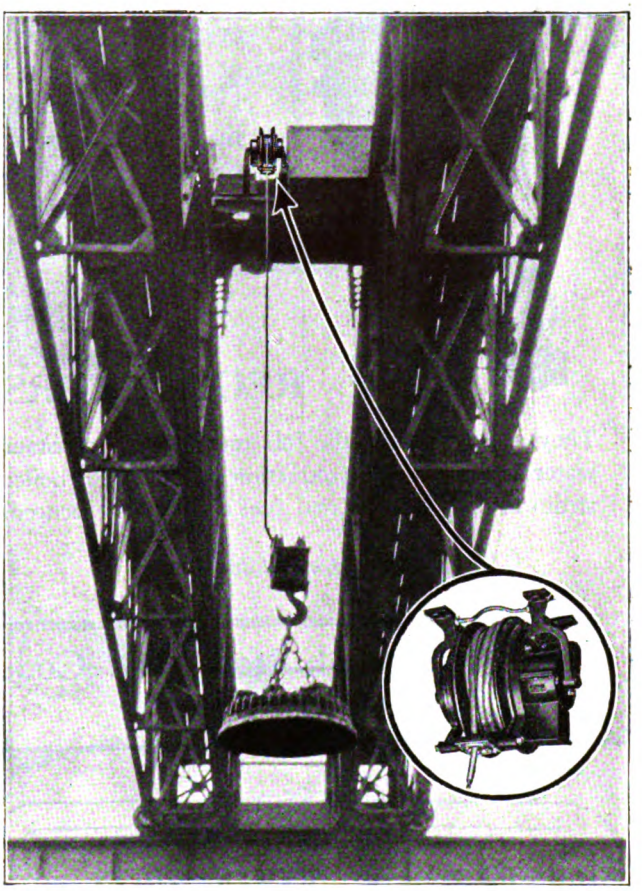
2. Eliminates the danger of bare rails and wires, thus safeguarding employees.

3. Saves time of workmen and releases, for other duties, men who have been tending cable.

For Reelite carries current wherever it's needed—to traveling cranes, lifting magnets, boring mills, portable hoists and mobile transfer cars.

Cable is paid out and retrieved just as needed—never too little, never too much, no slack, no undue tension, no appreciable wear.

Send for this new, profusely illustrated bulletin which shows all models. It will point the way to operating economies you have never known before.



Constant Duty Reelite as used with lifting magnet on travelling crane at McKee's Rocks (Pa.) Plant of Pressed Steel Car Co.



Constant Duty Reelite with Ball Ring Cable Outlet as Used in Connection with Lifting Magnet by Cohen Iron & Metal Company, Milwaukee, Wisc.



Constant Duty Reelite with Swivel Cable Outlet as Used on Sand Cutting Machines Made by American Foundry Equipment Company, Mishawaka, Ind.



Constant Duty Reelite with Ball Ring Cable Outlet as Used in Connection with Electrically Operated Portable Elevator in Paper Stock Room of a Large Newspaper.



CONSTANT DUTY

Reelite

REG. U. S. PAT. OFF.

Carries Current Where Needed

APPLETON ELECTRIC CO.
1716 Wellington Ave., Chicago

Gentlemen:

Please send us a copy of your new Bulletin 501-S together with prices and discounts.

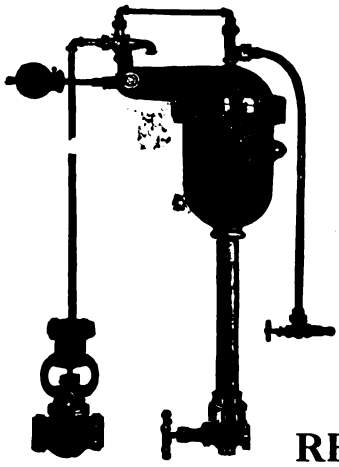
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is secured when the water in boilers is maintained at a constant level. Careless hand feeding is being replaced in modern power plants by

VIGILANT
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REGULATORS

They are always on the job and insure a constant water level. Steam production is increased, boiler strain is relieved, and real fuel economy is secured.

Send for catalogue

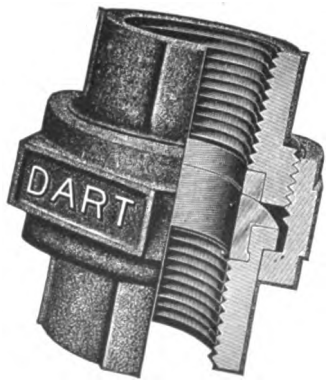
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Save Steam — Save Power
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DART UNIONS on your steam, air, gas and water lines, stay tight. They do not require packing. They are non-corrosive. There is nothing in a **DART UNION** to collect sediment —the path is right through without cored parts to weaken the union. Bronze to bronze seating surfaces, ground to absolutely tight seating ball and socket joints, make them leak-proof.

And they are guaranteed—two for one if found defective. Write for sample and prices.



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Providence, R. I.

Sales Agents
THE FAIRBANKS COMPANY
New York

Canadian Factory
DART UNION CO., Ltd.
Toronto, Ont.

(*Continued from page* **106**)

The Hydraulic Society, 90 West Street, New York, has recently published an 80 page, 8½x11 inch pamphlet entitled: "Standards of the Hydraulic Society." The book is illustrated with halftones, charts, tables, etc., relating to pumps and contains a list of parts and definitions covering reciprocating, rotary and deep well types: tables, formulas and data on pipe friction for both water and oil. Copies may be had for fifty cents upon application to the secretary of the Society, C. H. Rohrbach, 90 West St., New York.

* * * * *

A pamphlet of interest and value to factory managers contains the regulations, as of August 1, 1927, of the Interstate Commerce Commission covering transportation of explosives and other dangerous articles by freight and express and as baggage. The size and nature of the containers are specified, proper marking of cars containing dangerous articles, precautions regarding tank cars loaded by these specifications; and as they are binding on all common carriers engaged in interstate or foreign commerce, the shipping department of a plant must be familiar with the requirements.

* * * * *

Seamless Flexible Metal Hose is the title of Bulletin 201-29-C, issued by Chas. Cory & Sons, Inc., 185 Varick St., New York. It describes the various types of metal hose made by this firm, for steam, air and gas lines, expansion connections; hose for high temperatures and pressures, as well as fittings for every type and duty.

* * * * *

The annual meeting of the American Society for Testing Materials, held June 20-24, 1927, brought out a number of interesting papers on such subjects as testing of wrought and cast iron; on rubber, textiles, coal and timber; steel, petroleum products, preservative coatings; non-ferrous metals and metallography; clay, concrete products and building stones, etc., etc. Copies of the Proceedings, and the society's Bulletin, may be obtained at 1315 Spruce St., Philadelphia, Pa.

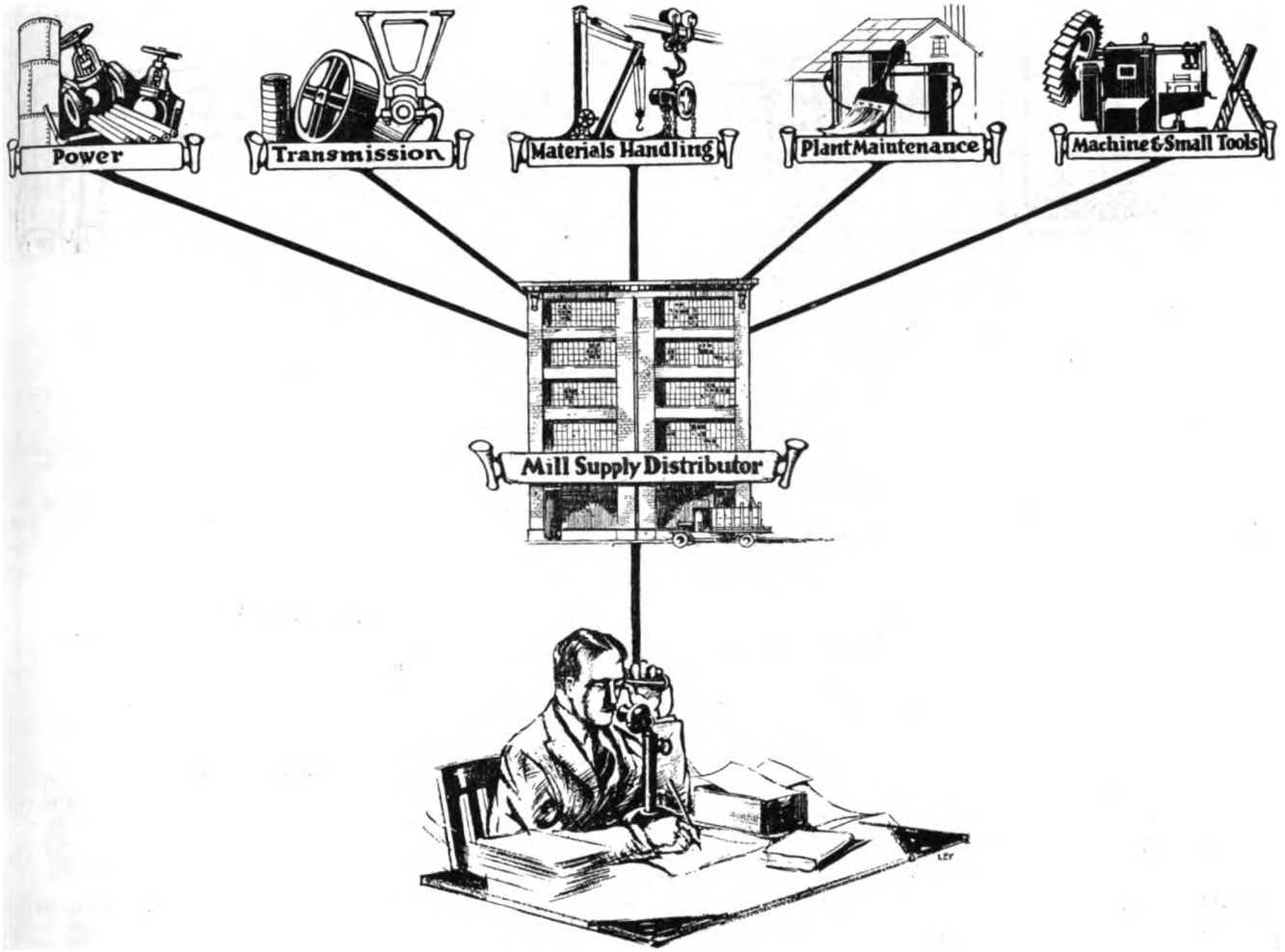
* * * * *

A well-illustrated booklet of fifty-six pages, 7½ x10¾ inches, has been issued by Taylor Instrument Companies, Rochester, N. Y. It is Catalog Part 300 devoted to Tycos instruments for refrigeration and cold-storage plants. Thermometers for use on ammonia suction lines, cooling water mains, air mains, brine tanks, etc., ice cream freezers and cold-storage rooms, as well as many other applications are described and illustrated. Prices quoted are as of January,, 1927. The pamphlet contains also tables of vapor pressure and temperature of ammonia, sodium chloride and calcium chloride and the cold-storage temperatures recommended for fruit, meats, fish, vegetables, canned goods, etc.

* * * * *

The Linde Air Products Company, New York, recently published the results of a series of tests of insert plate joints in Fink type roof trusses. Fire trusses were tested in order to compare the strength of riveted gusset plates with those oxy-acetylene welded. Very careful studies were made of these welds and the result of the tests was considered to prove the advantage of the welding method for this particular work. Cost studies were made during the investigation and these also were given. booklet, entitled "Oxwelded Roof Trusses" by Moss, of the development section of the engineer- partment, forms a valuable study of this process analytical discussion of the results.

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HAVE you ever stopped to consider how much real service the machinery and mill supply distributor can give you?

Through his long and intimate knowledge of local conditions, your distributor has chosen the best equipment, machinery and supplies to fit in with your own particular requirements—products of manufacturers who have proven their reliability and have established reputations.

The distributor reduces the necessity of maintaining enormous stocks of supplies; he practically eliminates inventory costs and warehouse expenses; he obviates the necessity of clerical hire and storeroom accounting systems, and he saves valuable time all along the line.

For all this service, **you pay no more in buying from your distributor.**

One of a series of advertisements published in the interest of a better understanding between the industrial buyer and the mill supply distributor

Buy from the Machinery and Mill Supply Distributor

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BEARINGS

Oilless Bearings—Bearings that give years of service without wearing and cut manufacturing costs are described by The Arguto Oilless Bearing Company. See page 41.

Ball Bearings—that support shafts and gears of mechanisms installed in out of the way, hard to get at places without measurable wear. See page 35. The New Departure Manufacturing Co.

Roller Bearings—Shocks of load and impact are easily absorbed by sturdy Hyatt Roller Bearings in wheels. See page 79.

ELECTRICAL EQUIPMENT

(Motors, Generators, Buffers, Polishers, Grinders, etc.)

Motors—That give satisfaction. The Master Electric Co. See page 95.

—with the guarantee and reputation of always making good on the hard jobs. See page 45. Howell Electric Motors Company.

—Backed by 21 years of experience in applying anti-friction bearings to electric motors. See page 97. Reliance Electric & Engineering Co.

Motorized Power—fitted to every need. General Electric Company. Pages 64-65.

Portable Electric Lights—Bulletin 501-S, describing all the uses of the Reelite cable, is offered by Appleton Electric Company. Page 107.

Lights—Where and when needed are described by The American Fixture Company. Page 103.

Electric Toolpost Grinders—Write for booklet "1/10,000 of an Inch." See page 49. Wisconsin Electric Co.

Arc Welding—Prizes will be won by those who demonstrate how arc welding can be made of greater benefit to humanity. For contest details, see page 8. The Lincoln Electric Company.

MAINTENANCE

Brushes—and wire wheels. Guaranteed to stay together for full service life. See page 63. The Osborn Manufacturing Company.

Paints—Paint preservatives are shown on page 105 by L. Sonneborn Sons, Inc.

—The Vortex Painting Method is described by The Vortex Manufacturing Company. Page 102.

—Dixon's Silica-Graphite Paint effective as protective coating. Write for Booklet 61-B and Color Card. See page 103. Joseph Dixon Crucible Company.

—Smooth and non-porous, resists dirt and washes like tile. See pages 4-5. U. S. Gutta Percha Paint Company.

Doors—that protect life and property. Prevent spread of fires. Send for catalog. Page 25. Richards-Wilcox Mfg. Company.

Fans—A man coooling fan that increases production is described in circulars offered by Robinson Ventilating Company. Page 90.

Exhaust Fans—quiet operating exhaust fans for private and general offices. See page 88. Diehl Manufacturing Company.

Paint Spray Equipment—Pays for itself in what it saves. Binks Spray Equipment Co. See page 2.

—One spray does all your painting. Five times faster than a brush. Saves 80% in time and cost. The Alexander Milburn Co. See page 34.

Shop Cans—Built for rough usage. See page 94. The Witt Cornice Company.

Window Cleaners—Cleans the dirtiest windows quickly and safely. See page 44. The Gerson Stewart Corp.

Cleaning Material—Industrial Cleaning Materials and Methods are described by The Oakite Products, Inc., Page 42.

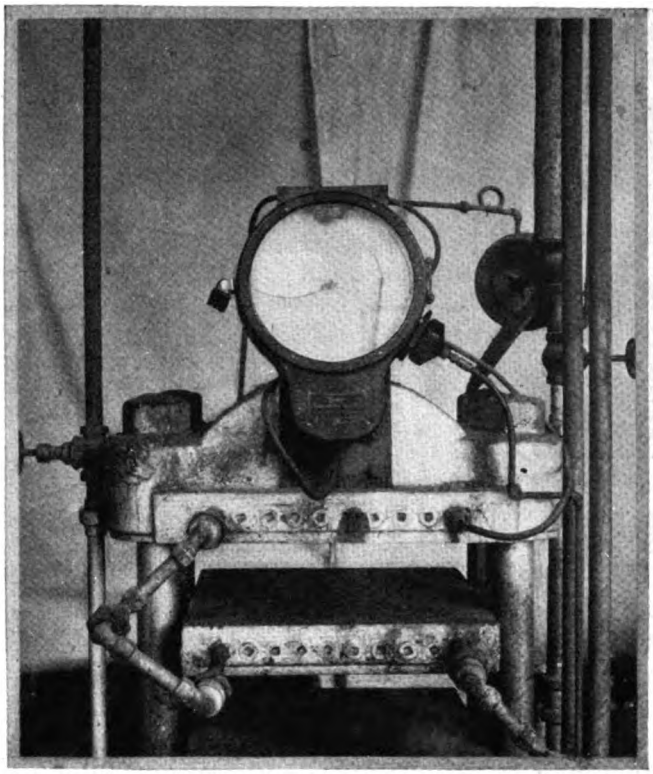
Monitors—designed to increase daylight. See page 30 Detroit Steel Product Company.

MATERIALS HANDLING

Conveyors—Complete information on J[illegible] Belt Conveyors sent on request. Page 47. Th[illegible]nufacturing Company.

Conveyors that effect enormous savings in labor costs and floor space in addition to speeding up production. Anchor Steel & Engineering Company. Page 119.

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Because they combine large starting capacity with great mechanical stability, Medart clutches *actually clutch*. Properly placed, they will divide and sub-divide line shafting equipment into units that permit quick control of the various departments, resulting in many saving conveniences and safety benefits.

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MEDART
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Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company. Page 78.

For eliminating handling wastes, reducing time between operations, write for "Seven Economies of Logan Conveyors." Logan Company. See page 1.

Belt Conveyors—that save man power. See page 46. Weller Mfg. Co.

Pneumatic Conveying—The modern system that recovers 99% of dust and fumes. The Dust Recovering & Conveying Company. Page 91.

Scales—Automatic and dustproof scales for all purposes. See page 89. Richardson Scale Company.

—"Weigh While You Convey," described by The Merrick Scale Mfg. Co. Page 86.

Lift Trucks—and platforms that won't wear down or wabble. The Stuebing-Cowan Co. See page 71.

Electric Trucks and Tractors—to cover every conceivable industrial need. Write for booklet 35-A. The Lakewood Engineering Company. See page 82.

Gas Tractor—the latest addition to the Mercury line. Write for Bulletin No. 110. See page 81. Mercury Manufacturing Company.

Rail Gripper—Switching Power at a Minimum Cost. See page 89. G. D. Rowell & Son.

Portable Cranes—A Small Portable Crane that is sent on 30 days' trial is described in Catalog IN. The Canton Foundry & Machine Company. See page 86.

Chain Blocks—Spur-geared — Screw-geared — Differential. Write for details on the one best suited for your purpose. See page 76. The Yale & Towne Mfg. Co.

Casters—that result in easier rolling and turning. See page 85. The Bassick Company.

Car Movers—That move heavily loaded cars are described by The Appleton Car Mover Company. Page 80.

Pickling Baskets—welded carefully and inspected before delivery. See page 88. The Breese Bros. Co.

Hoists—to speed up production. Roeper Crane & Hoist Works, Inc. See page 80.

A "G-M" idea plus "C-M" equipment will make savings for you. Write for booklet. See page 83. The Chisholm-Moore Mfg. Co.

Electric Hoists—that enable operators to keep machines busy without waiting for a lift by traveling crane. Bulletin gives full details. See page 80. Roeper Crane & Hoist Works, Inc.

—with push button control. Simple, sure and safe. Sprague Electric Hoists, Division of Shepard Electric Crane & Hoist Co. See page 87.

Electric Hoists—an electric hoist for every purpose. Shepard Electric Crane & Hoist Company. See Back Cover.

Pressed Steel Equipment—For materials handling. Write for illustrated literature and prices. See page 50. The Powell Pressed Steel Co.

Materials Handling Equipment—Leading manufacturers of Elevating, Conveying and Power Transmission Chains and Machinery. See page 120. Link-Belt Company.

Overhead Monorail Systems—A new seventy-two page book on materials handling via the ceiling. See page 39. The Louden Machinery Co.

Wire Rope—of uniform construction that gives maximum protection. Williamsport Wire Rope Company. See page 100.

Overhead Handling Systems—A complete line of hoists, chain blocks, trolleys, traveling cranes, and monorails. See Reading Chain & Block Corp. See Inside Back Cover.

POWER PLANT EQUIPMENT AND AUXILIARIES

Unit Heaters—A heater that raises the efficiency of the worker. American Blower Co. See page 43.

—Four distinct and separate types. Write for book.

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TRIMO

The Pipe to the Pipe Cutter:



SPEAKING of operations, looks like I'm due for a little cutting up, Mr. Trimo? Is it going to hurt me, Doc? No need to ask that, though; you always do a quick, clean job, Trimo. It hurts my pride some, though, to have you go through me as if I was made of cheese instead of metal. And just when I figure that you're getting a bit old and feeble, you break out with a new Trimo cutting wheel that's sharper than ever. I ask you, is that fair?

Trimo to the Pipe:



Never mind crabbing, old boy. I never hurt you yet, did I? This job will be over before you know it and it will be a clean cut that you'll be proud of. There's no use being stubborn; you haven't got a chance. The boss just put some new Trimo thin blade cutter wheels in me that will make you wonder if you're a piece of pipe or macaroni. They're something brand new and so good that my factory has made them to fit my old friends, the Barnes and Saunders type cutters.

The Workman has his say:



It's a pretty one-sided game when you sic a Trimo on a pipe. The pipe just does what you tell it to. And these new Trimo cutter wheels make the job even easier. I figure that I get two tools for one when I buy a Trimo because I can make either a one wheel or a three wheel cutter out of it in a jiffy. But you have to watch the imitations these days and be on your guard. Always specify TRIMO.



MEMO: When a man asks for a *pipe cutter*, he means a TRIMO

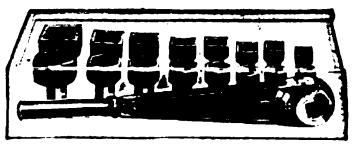
For Sale at Hardware, Plumbing and Mill Supply Stores

TRIMONT MFG. CO., Roxbury (Boston), Mass.

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GENERAL PURPOSE WRENCH
there is nothing to equal
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Convenient — Speedy — Time Saving



No. 1 Wrench has a 12-inch Handle and will take square or hexagon nuts. ¼, 5/16, ⅜, 7/16, ½, 9/16, ⅝, ¾ inch Bolt Diameters. 1/2, 17/32, 9/16, 19/32, ⅞, 21/32, 1 1/16, 1¼ inch Smaller Outside Diameters.



No. 2 Wrench has a 20-inch Handle and will take square or hexagon nuts. ¾, ⅞, 1, 1⅛, 1¼ inch Bolt Diameters. 1¼, 1 5/16, 1⅝, 1 13/16, 2 inch Smaller Outside Diameters.

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City .....

"Industrial Heating." See page 67. Buffalo Forge Company.

Portable Dust Blowers—that reduce fire hazard and motor troubles. See page 90. Electric Blower Company.

Sewage Ejectors—Write for Bulletin No. 67, which gives complete information. See page 10. Nash Engineering Company.

Feed Water Regulators—always on the job, insuring a constant water level. Send for catalog. See page 108. The Chaplin-Fulton Mfg. Co.

Temperature Regulator—Sarco Temperature Regulator puts a stop to guesswork. Test it thirty days free. See page 98. Sarco Co., Inc.

Unions—A free trial offer is made by E. M. Dart Mfg. Co. Page 108.

Agitator Drives—For extra heavy duty. See page 117. New England Tank & Tower Company.

Steam Traps—Backed by 35 years experience and a positive guarantee. Write for Bulletin 833. Illinois Engineering Company. Page 38.

TOOLS AND SHOP EQUIPMENT

Vises—Wherever a pipe must be held, the Genuine Williams' Vulcan Vise is the last word in efficiency. Page 59. J. H. Williams & Co.

For use where smooth operation, economy and efficiency are desired. See page 50. The Charles Parker Company.

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Surface Grinders—Particularly efficient on a wide variety of small tools. Full particulars may be had from the La Salle Tool Company. See page 70.

Ball Bearing Grinders—Alternating and Direct Current. See page 61. The United States Electrical Tool Company.

Bolt Clippers—that are time savers. See page 68. H. K. Porter, Inc.

Shovels—Make a test of H. K. Wood's Mo-lyb-den-um Steel Shovels on any job that seems to be using too many shovels. See page 40. The Wood Shovel and Tool Company.

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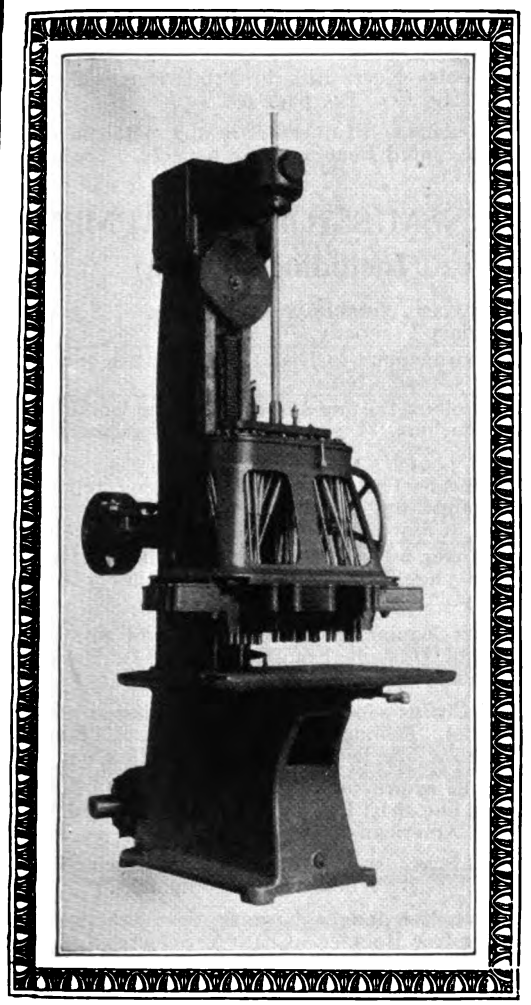
Drills—For high speed drills, see The Standard Tool Company. See page 55.

The six famous twist drills are described by The Cleveland Twist Drill Company. See page 73.

2-Speed Electric Drills—necessary for maximum efficiency. See page 60. The Cincinnati Electrical Tool Co.

Drivers—Every one guaranteed unconditionally. American Saw & Mfg. Co. Page 60.

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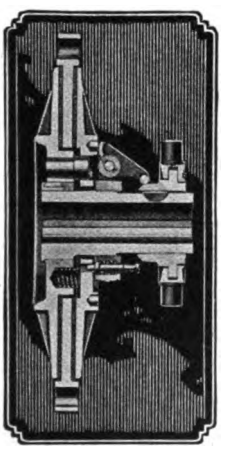
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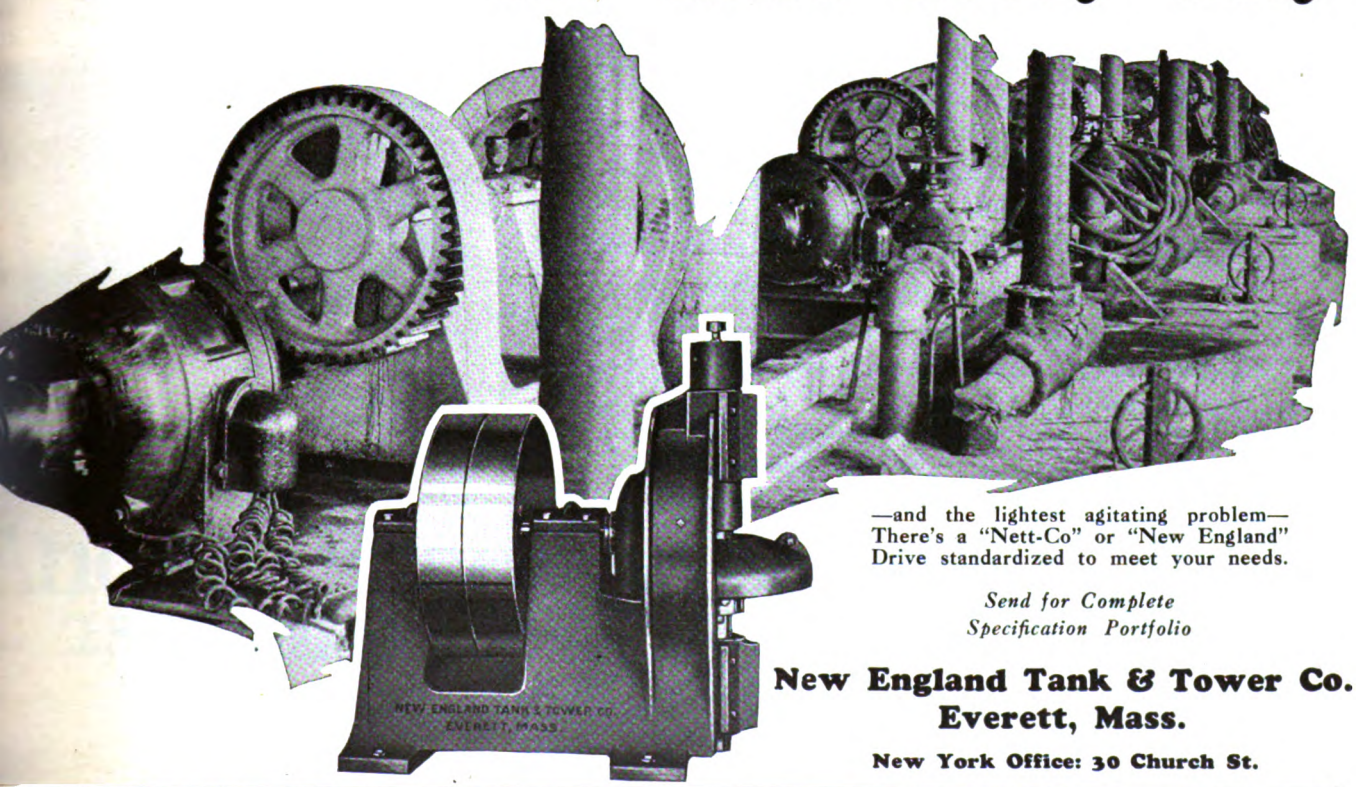
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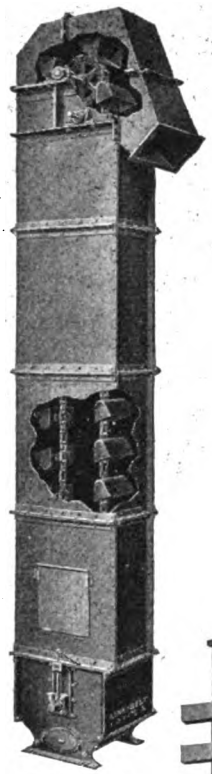
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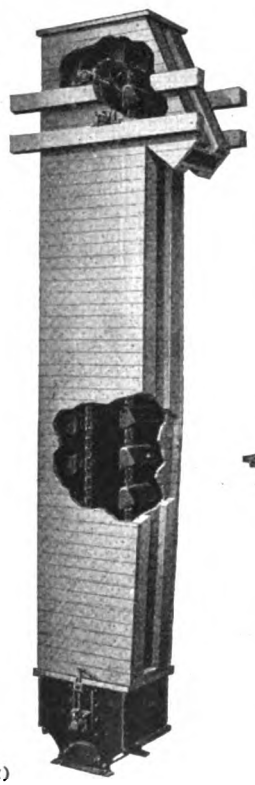
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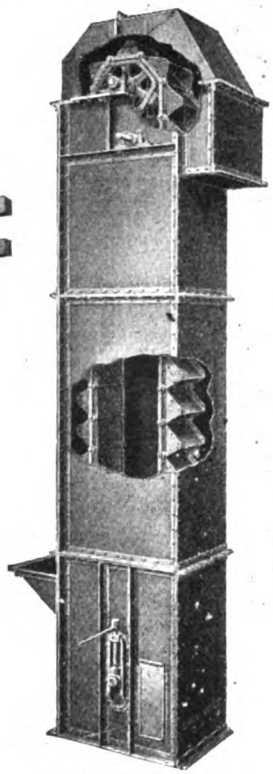
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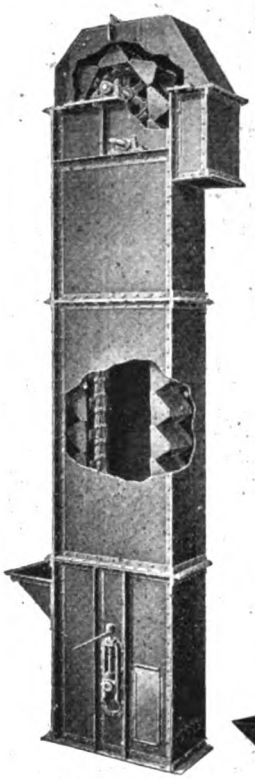
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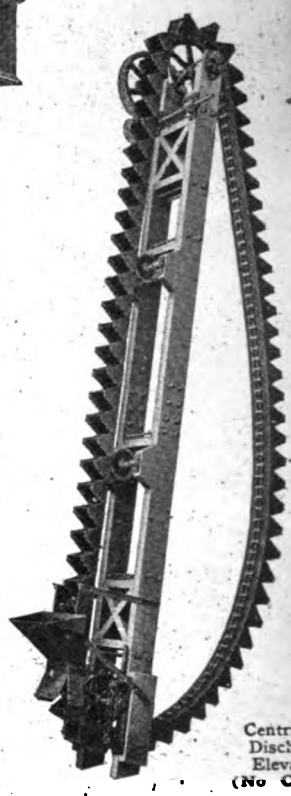
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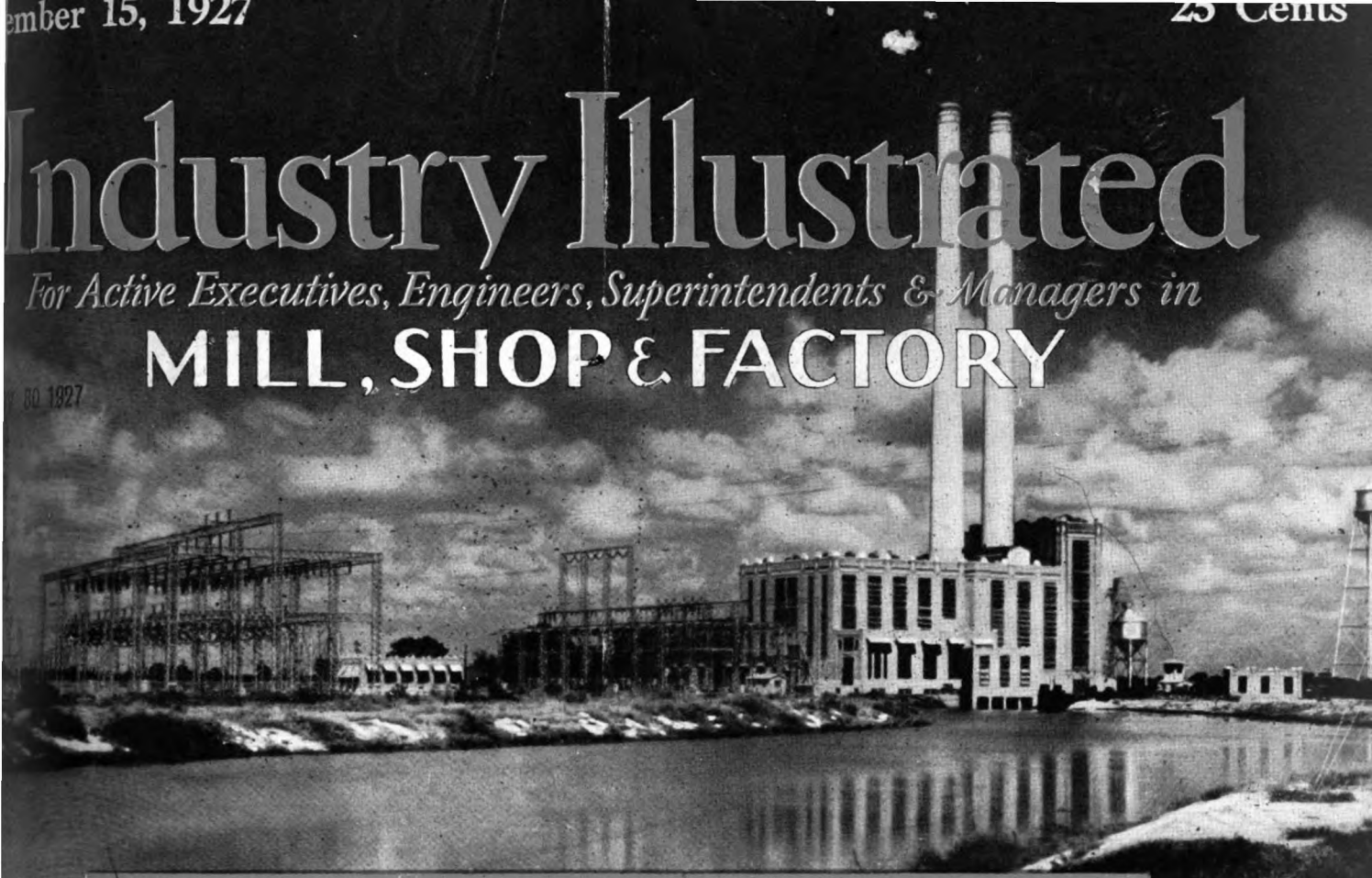
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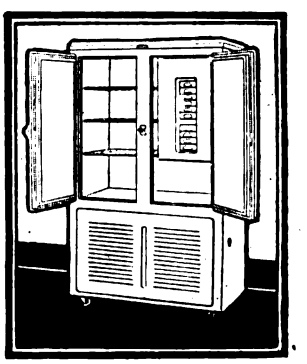
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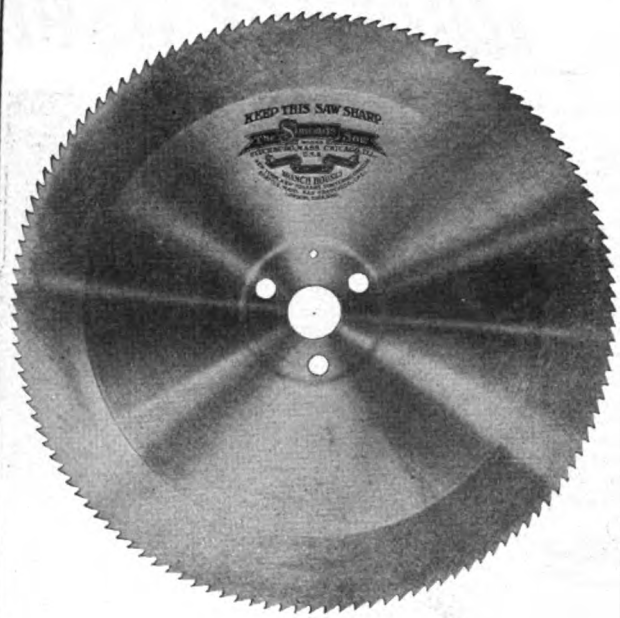
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Industrial Purchasing

THE Purchasing Department which appears in this issue marks an advance in the policy of a publication devoted to the shops and the men who run them—namely: A recognition of the growing importance of the purchasing function in the field of manufacturing economics.

The old-time designation of the man who did the buying as a purchasing *agent* about expresses the then current idea of the duties of that individual. An agent, in the real estate terminology of those days was one who collected rents. He might let the property run down and put the tenants out on the street, but he *must* get the rent.

A purchasing agent, by the same reasoning, was an expert horse-trader. Both he and his employer joyfully acclaimed the full performance of his duty as the occasional purchase of something at less than cost. That people from whom he bought soon got to know how far he expected to beat them down—and put up their prices just that far—never seemed to penetrate.

But it has penetrated the consciousness of the new school of purchasers—who prefer to be called Purchase Managers—not agents. These men recognize that they are playing an important part in the science of management, i.e. in getting the most for money paid out—not the most for the least money as in the days of penny-wisdom and dollar-foolishness.

The modern Purchase Manager (we prefer that designation) is less a trader than a statistician. Sometimes he is an engineer who knows his Production. Often he is an economist, a student of the workings of the basic laws of supply. In any case, he is a man who can be approached successfully only by a clean-cut statement of facts. He no longer collects cigars or stories. He gathers statistics of performance of machines and materials. If you have something to sell him, it will be well to bear this in mind.

Morgan G. Farrell

Editor

Industry Illustrated

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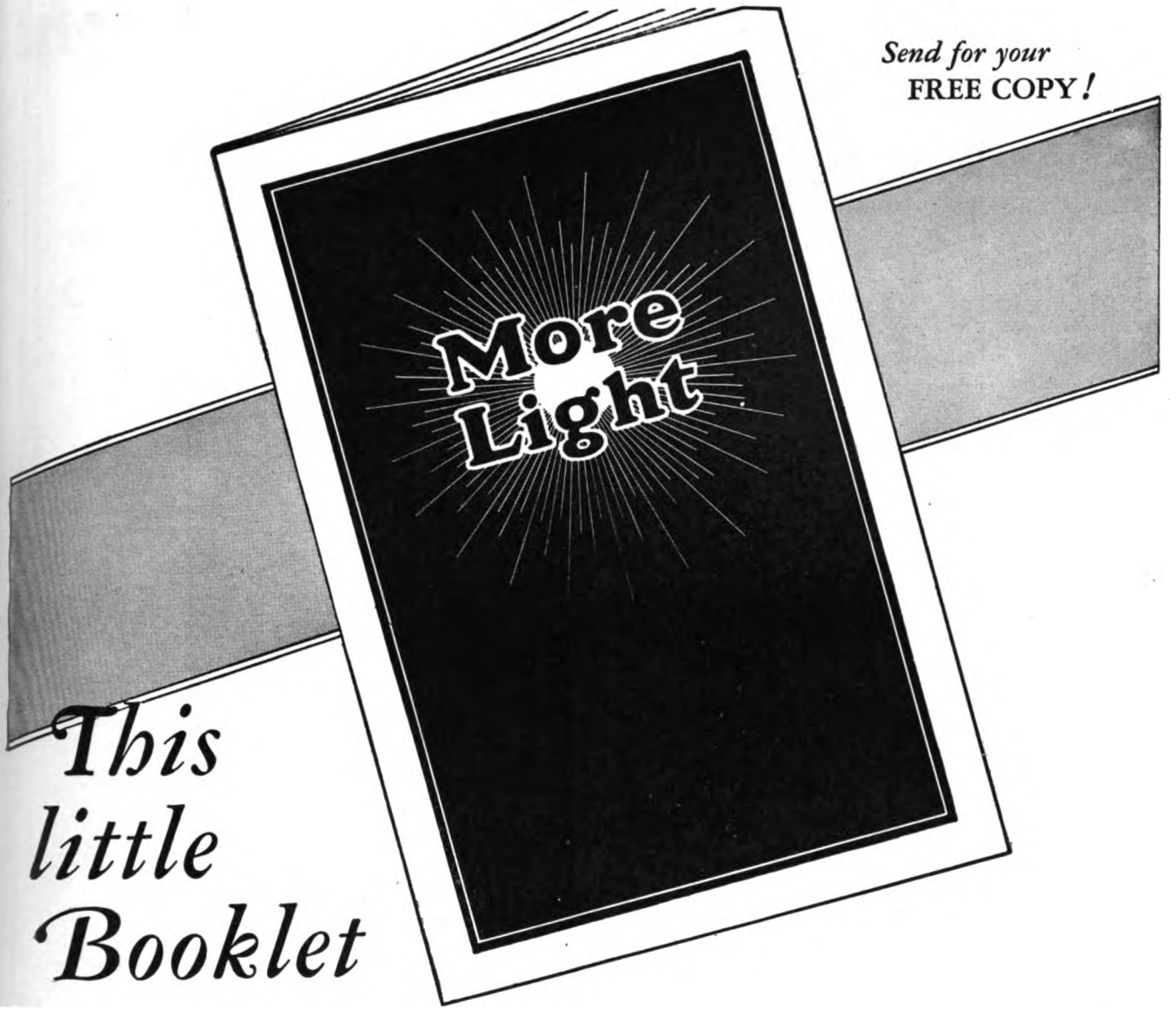
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But we believe that our booklet, shown above, contains facts and honest testimony of actual users, which do prove that Barreled Sunlight resists yellowing, will not flake, washes like tile, and can be applied at the lowest cost per square foot covered.

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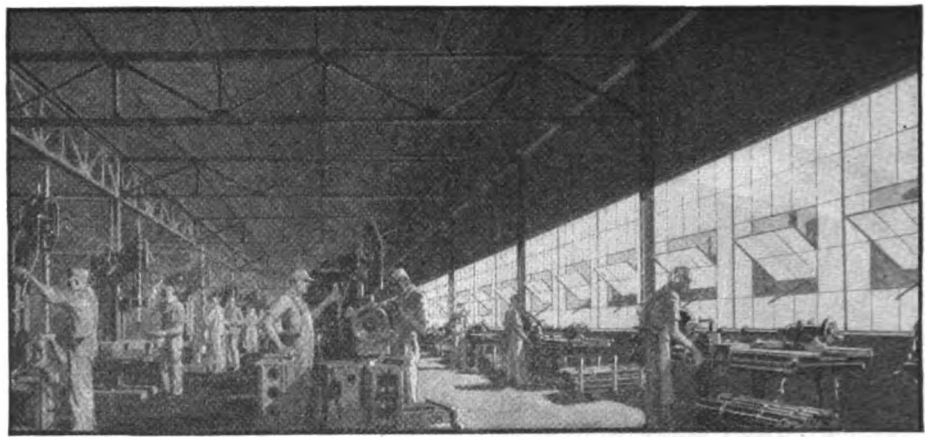
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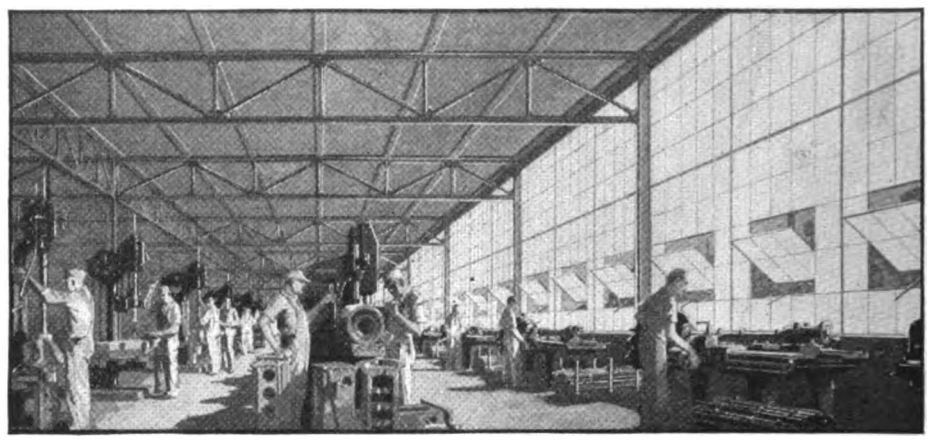
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Showing daylighting result through sidewall nine panes high.

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What is the relative value of the upper and lower portions of the windows for daylight distribution?

How does the sill height of the window affect the daylighting?

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From the first assembly frame to the baking ovens, this conveyor handles the cabinets to and from eight processes of manufacture.

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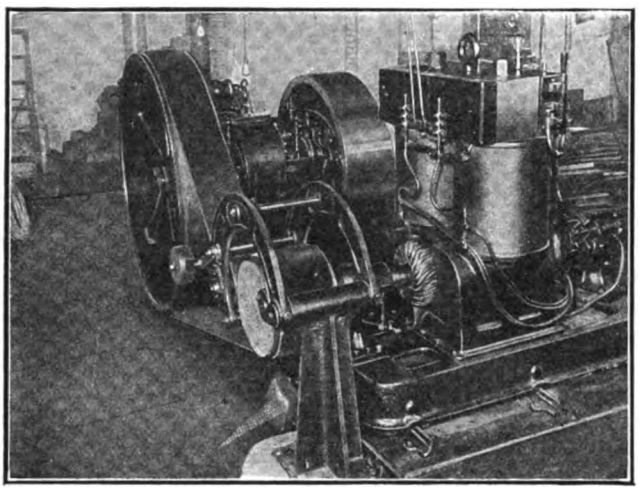
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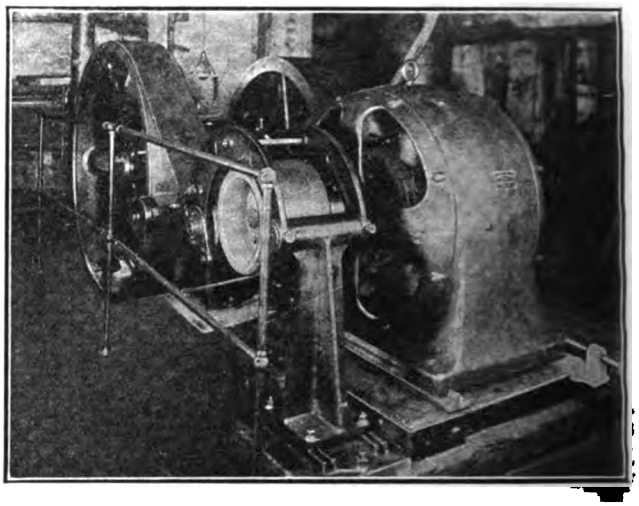
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Pulley centers 6'6"

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For *seventeen years*, this installation was in daily service and, with the exception of one new belt, the outlay for upkeep was, in the words of the superintendent, "not a cent."

In 1925 the old steam engine and generator were replaced by modern units, and as illustrated above at the right, the old LENIX was used with the new equipment.

This record of over *nineteen years* of daily service is proof of the reliability and soundness of design and construction of the LENIX. This installation is only one of many still in service after nearly twenty years of operation. There are now thousands of LENIXES installed on drives in units of from 1 H. P. to 1400 H. P. in practically every industry.

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Building Space
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The LENIX is the pioneer short center belt drive. Our extensive experience, the result of more than twenty years of designing and building LENIXES, is offered for the solution of your belt drive problems.

A card will bring you full information.

The LENIX will be exhibited at the Power Show, Grand Central Palace, New York, December 5 to 10, 1927. Our engineers, competent to cope with any belt drive problem, existing or contemplated, will be in attendance. Visit us at Booths 281-2 on the Mezzanine Floor.

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(Trade Mark Reg.)

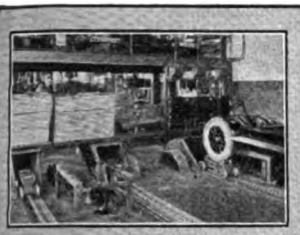
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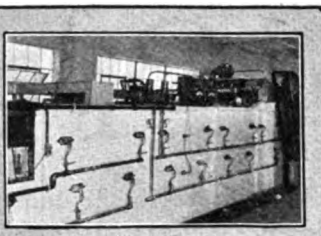
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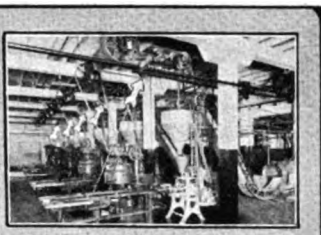
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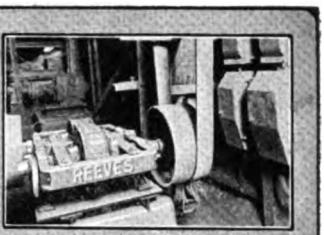
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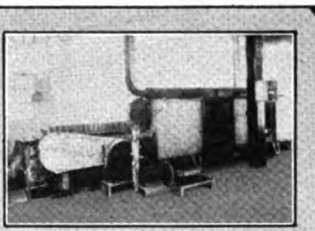
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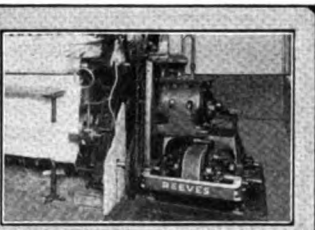
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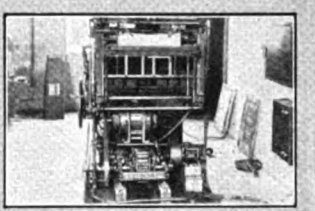

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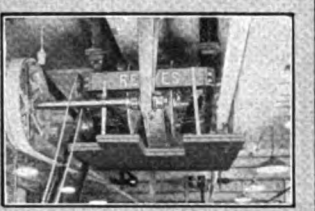


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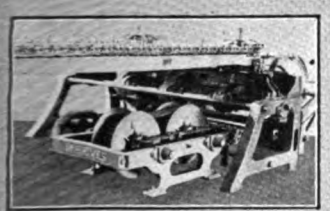

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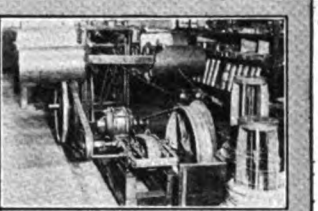

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ANY SPEED ON ANY MACHINE AT ANY TIME

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Synchronized Operation

Everywhere in the Industry, Nuttall helical gear speed reducers are synchronizing and coordinating manufacturing processes. Smooth and quiet in operation, they give perfect timing between each individual job producing a unified whole which means maximum production.

Simply and sturdily constructed, year after year, they go about their job of keeping things moving. They require no care or attention beyond the occasional addition of oil to the case.

The single reduction speed reducers will transmit up to 450 h.p., and have a maximum reduction of 8.1; the double reduction reducers are rated up to 200 h.p., and have reductions available up to 47.1.

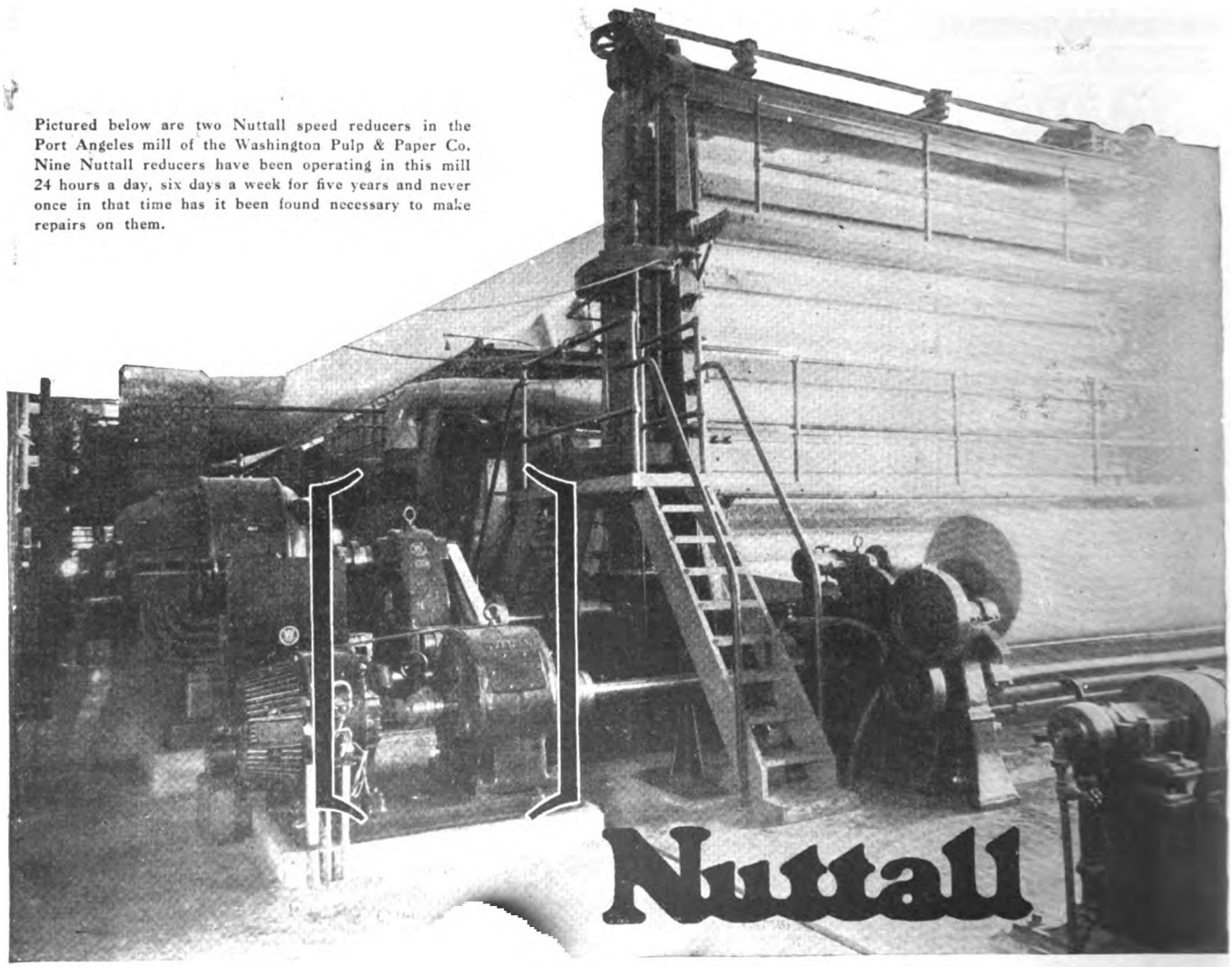
We will be very glad to send you our bulletin describing our speed reducers. You will need the information in this booklet in solving your speed reduction problems.

R. D. NUTTALL CO., Pittsburgh, Pa.

Philadelphia Chicago Wilkes-Barre Los Angeles

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Pictured below are two Nuttall speed reducers in the Port Angeles mill of the Washington Pulp & Paper Co. Nine Nuttall reducers have been operating in this mill 24 hours a day, six days a week for five years and never once in that time has it been found necessary to make repairs on them.



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Industry Illustrated

For Active Executives, Engineers, Superintendents and Managers

In Mills, Shops & Factories

JOHN R. DUNLAP and MORGAN G. FARRELL *Editors*

W. THOMSON LEES *Associate Editor* ADOLF SCHILDKRAUT *Art Director*

Contents—November 15, 1927

The cover photo shows the Trinidad Steam-Electric Station of the Texas Power & Light Company on the Trinity River, near Malakoff, Texas. Its installed capacity is 40,000 k. w. and its ultimate capacity 160,000 k. w.

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Steel Shelving in the Storeroom Stops Waste of Space and Loss of Stock 29
By B. B. POPELL

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Important Announcement

to the readers of

WITH this issue *"Industry Illustrated"* ceases to exist in its present form. Beginning with the December issue, it will be consolidated by its new owners, the McGraw-Shaw Company, with *"Industrial Engineering,"* a McGraw-Hill paper which the McGraw-Shaw Company has also acquired.

We take this opportunity of extending our grateful appreciation to all our friends for the interest they have always displayed and the encouragement they have given us in our efforts to provide useful reading matter.

We feel confident that the policies which have made *"Industry Illustrated"* useful to its readers will be continued under the new management and will be supplemented by those of the publication with which it will be consolidated. The experience of two great publishing organizations, the McGraw-Hill Publishing Company, and the A. W. Shaw Company, will be available to the McGraw-Shaw Company; and the consolidated paper should therefore set a high standard in business journalism.

We trust that thereby the work to which we have given our years of conscientious effort may go on.

JOHN R. DUNLAP
Founder and former publisher of
"Industry Illustrated"

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"Industry Illustrated"

CONSOLIDATION! Combined strength! Expanded service! It is with these ideals that, beginning with the December issue, *"Industry Illustrated"* will be merged with *"Industrial Engineering."*

Both magazines have rendered unusual service to American manufacturing. Both, while partially duplicating, have had strong, individual features. Both have laid particular emphasis upon adequate electrical operation in industry and the scientific application of power. It is to these fundamentals in all industrial operations that the combination will bring strengthened presentation. But there will be an expansion of service previously rendered, particularly by *"Industry Illustrated,"* on plant lighting, heating and ventilating; on material handling; on building construction; on building equipment and its maintenance.

The consolidated paper will be the magazine of plant service equipment and plant maintenance, with particular emphasis upon electrical operation. It will not deal with processing, or with manufacturing policy, the latter being the field of *"Factory and Industrial Management."* It will aim at the problems of all plant engineers, master mechanics, chief electricians, and other service men; as well as those superintendents and factory managers who are interested in plant service methods. It will bring them a well-rounded program of practical experience and proven methods, graphically illustrated by typical plant operations.

The editorial staffs of the two former papers will be consolidated, and back of the new publication will be combined resources of the two companies of which the McGraw-Shaw Company is a subsidiary.

In the new publication we pledge our service to the readers of *"Industry Illustrated,"* and we bespeak their continued interest.

JAMES H. MCGRAW
Chairman of Board

A. W. SHAW
President

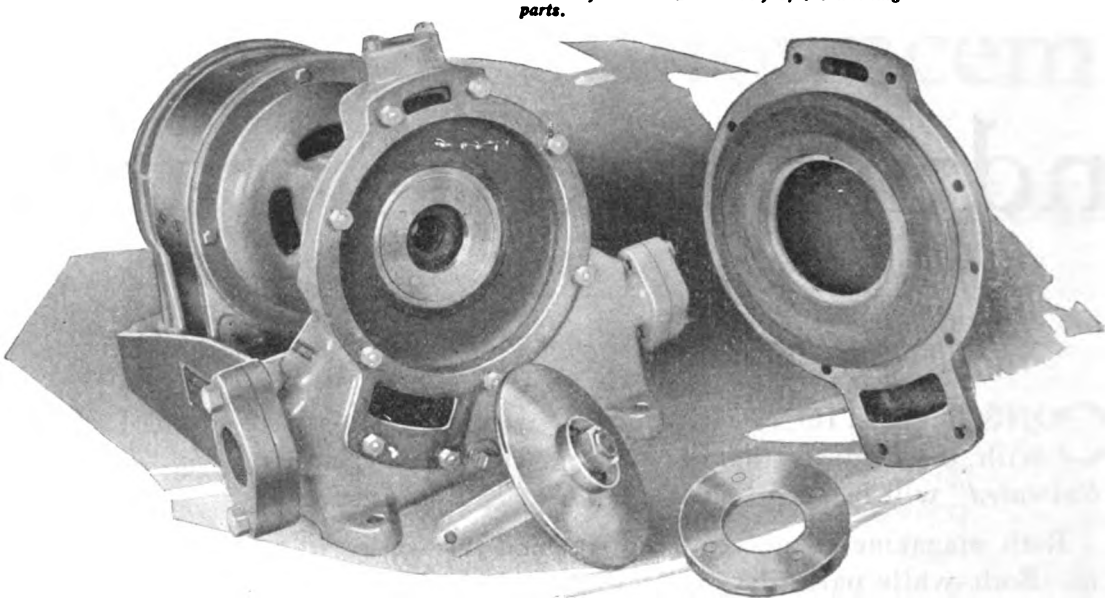
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View showing the Jennings Centrifugal Pump disassembled. Note the simple construction, also the accessibility of the working parts.



All working parts are accessible

By merely unbolting and removing the head, the entire interior of this new Jennings Centrifugal Pump becomes accessible.

Piping connections need not be broken. Nor shaft alignment disturbed. The impeller can be taken down without touching the bearings or packing.

Note that there is but one stuffing box—no bearings in the pump casing—only one shaft for supporting both the motor armature and the pump impeller.



Upon request, we shall gladly send you a copy of our centrifugal pump bulletin.

Jennings Pumps

Jennings Centrifugals are supplied in capacities up to 1000 g.p.m. against pressures up to and exceeding 100 lbs. for: (*a*) circulating hot and cold water. (*b*) boosting city water pressure. (*c*) handling water in air washing and conditioning. (*d*) removing condensate from heating systems, blow down from soot blowers and superheaters, exhaust drips from steam ejector air pumps and other auxiliaries. (*e*) pumping refrigerator can and core water, evaporator feed, cooling tower and condenser water, screen wash water, oil engine jacket water, ash sluicing water.

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How to Operate CYLINDRICAL GRINDERS *at a Profit*

By Frederick B. Heitkamp

Some of the grinding operations which have resulted in savings as high as forty per cent. by the use of 1927 model machines.

EXAMPLES have been taken from various types of machining operations to illustrate the returns which can be obtained through the installation of modern machine tools. This article has to do with the profits which have been increased as a result of the installation of modern Cylindrical Grinders of various types. The first illustration shows a 12"x72" Cylindrical Grinder, grinding a feed roll for printing presses, obtaining an unusually high finish. The time on this operation is 32 minutes as against the previous time of 45 minutes—quite an appreciable improvement.

Printing Press Feed Rolls present a real grinding problem. They require unusually high finish. These are ground on a 12"x96" Plain Self-Contained Grinding Machine in 32 minutes from the black pipe with no previous turning or grinding operation. Savings in production are due to: More spindle power behind the grinding wheel, the use of wider faced grinding wheels, faster table traverse permitting rapid and light grinding cuts where the nature of the roll being ground forbids heavy cutting; centralized control with all operating levers and handwheels so grouped as to permit the operator to reach each one without moving from one central operating position in front of the machine.

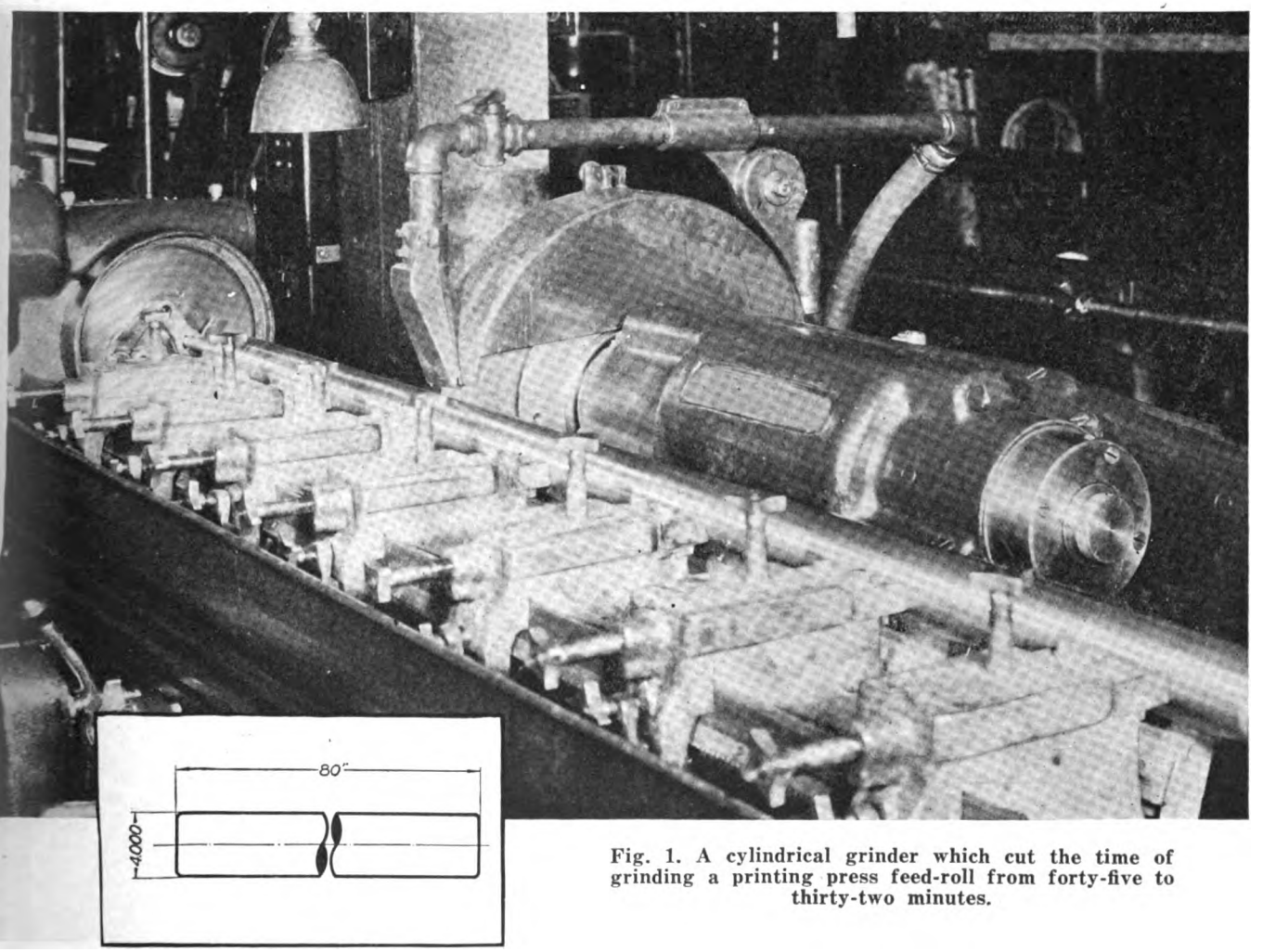


Fig. 1. A cylindrical grinder which cut the time of grinding a printing press feed-roll from forty-five to thirty-two minutes.

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There is an electrically operated speed changing device for work rotation.

The automobile industry was quick to recognize the advantages of plunge cut grinding and at the recent Machine Tool Exhibition at Cleveland machine and job shown in Fig. 2 created considerable interest. The operation is that of finish grinding a sleeve valve for a Willys-Knight Engine. .012" to .015" stock is removed from these cast iron sleeves, giving a production of 50 per hour. A 12 x 18" Plunge Cut Machine is equipped with a 11¼" wheel. This is one of a large battery of plunge cut machines in this plant. The footstock lever is operated with an automatic cam clamp which holds the work center out of the way when handling the sleeves valve. The wide face grinding wheel is moved slowly back and forth in its bearings by a reciprocating movement while taking the heavy cut, thus insuring a fine finish. The finishing machine shown in this illustration is driven by a wide endless belt to the grinding wheel spindle direct from a 20 horse power motor built into the machine. For heavy roughing operations a silent chain drive is used. The machine is equipped with an electric wheel infeed and wheel truing unit; and a special work cradle saves time in placing the work in and out of the machine.

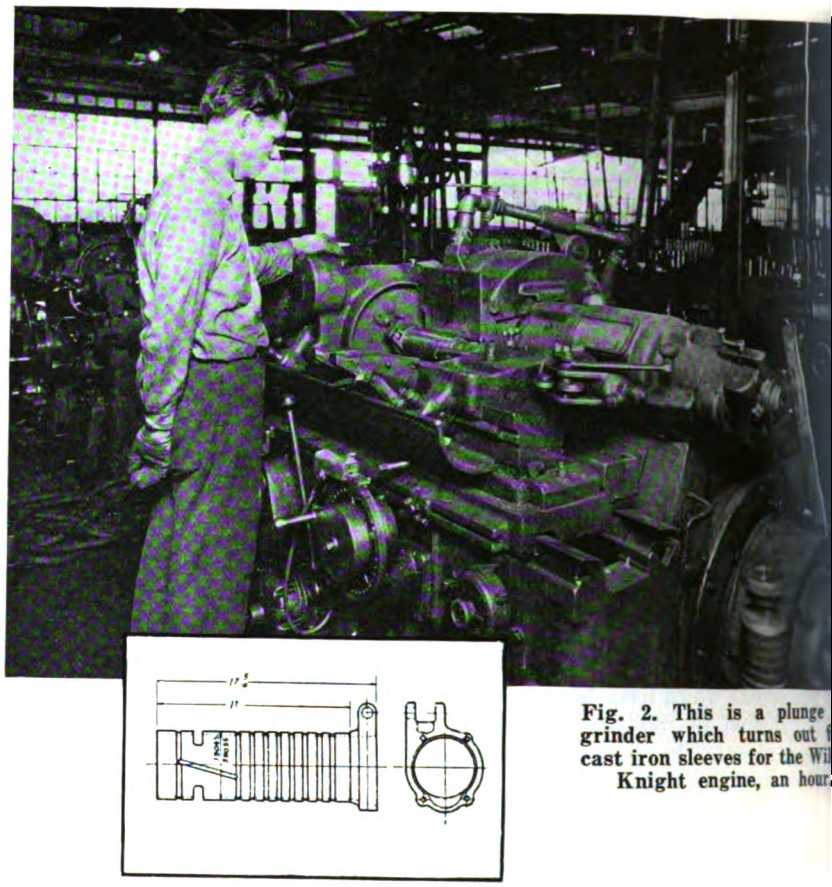


Fig. 2. This is a plunge grinder which turns out cast iron sleeves for the Wi Knight engine, an hour.

In the plant of the General Electric Company at Schenectady will be found the Plunge Cut Machine shown in Fig. 3. A motor Bearing Liner of machine steel is being finish ground to 4.125" in diameter x 6.75" long on the surface. .012" stock is removed. The limits are plus, .0000" for the maximum and minus .0005" minimum. 35 bearings at least are produced per hour. A 20" diameter Grinding Wheel with a 10" face gives an A No. 1 finish. A special driver saves dogging. One arbor is loaded while another is being ground. This machine has so reduced grinding costs that the installation has paid for itself within twelve months. A wheel spindle oscillating attachment keeps the wheel face wearing evenly, decreases the number of wheel dressing, and greatly improves the finish. An electrical infeed gives a smooth, uniform motion and eliminates the strains formerly placed on wheels by intermittent types of cross feeding mechanisms.

Plunge Cutting pipe balls make it possible to obtain the low time piece of 11 minutes each floor to floor on the ball shown in Fig. 4. The operation is that of rough

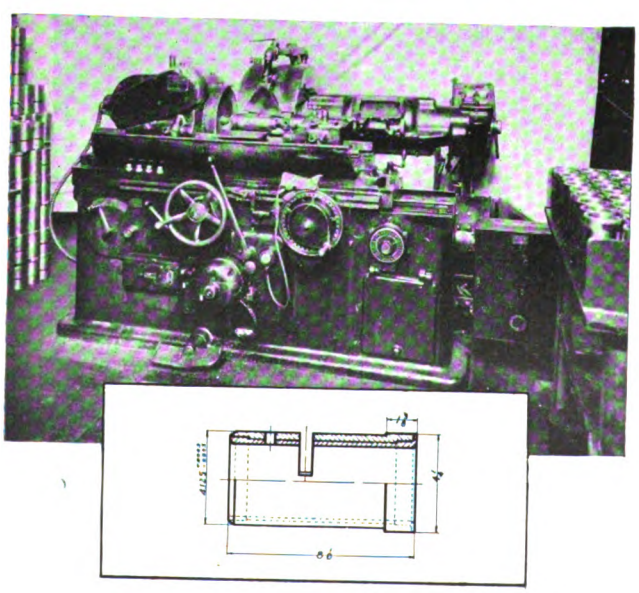


Fig. 3. Another plunge cut machine for producing thirty-five motor-bearing liners an hour.

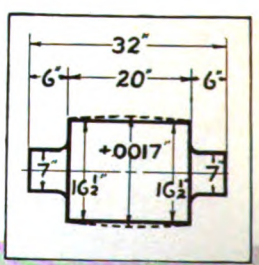
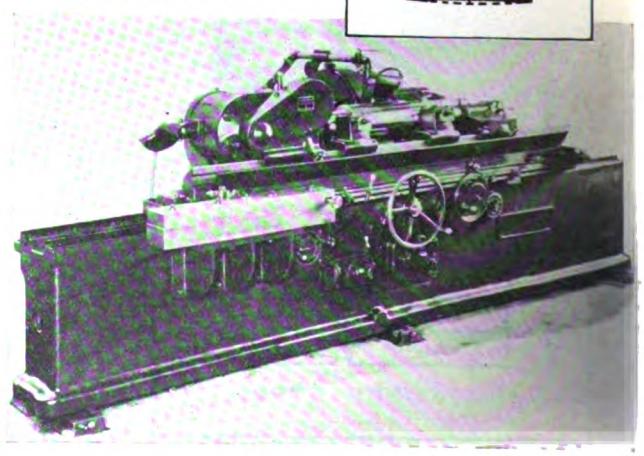
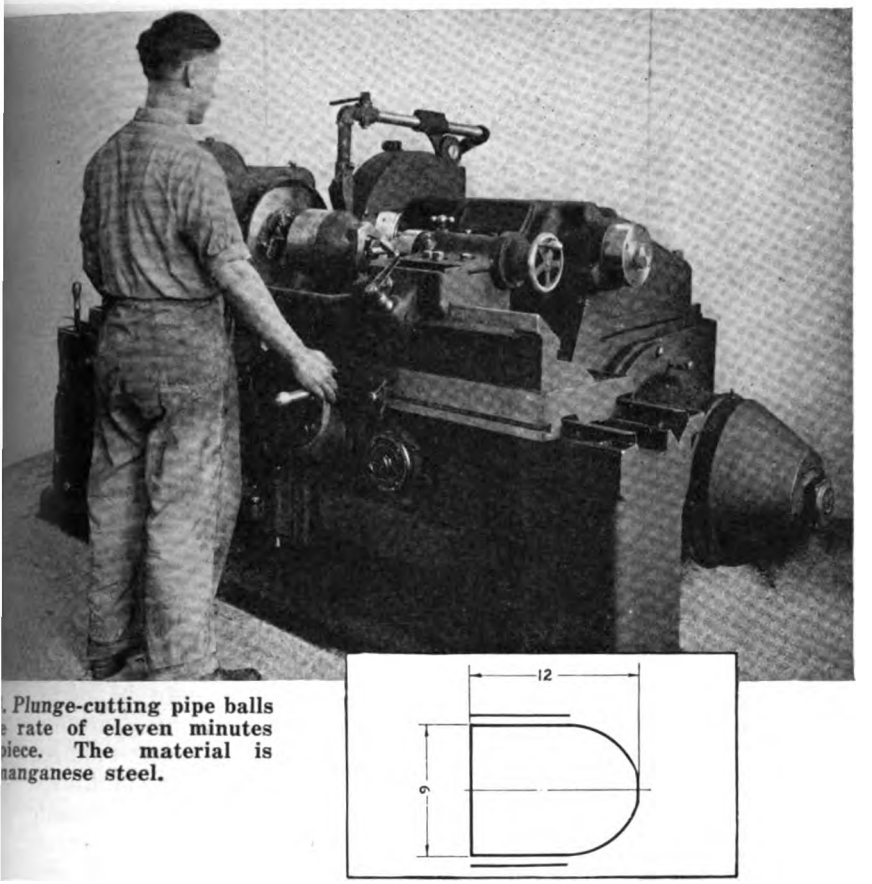


Fig. 5. Grinding an extremely high finish on rollers for producing foil.



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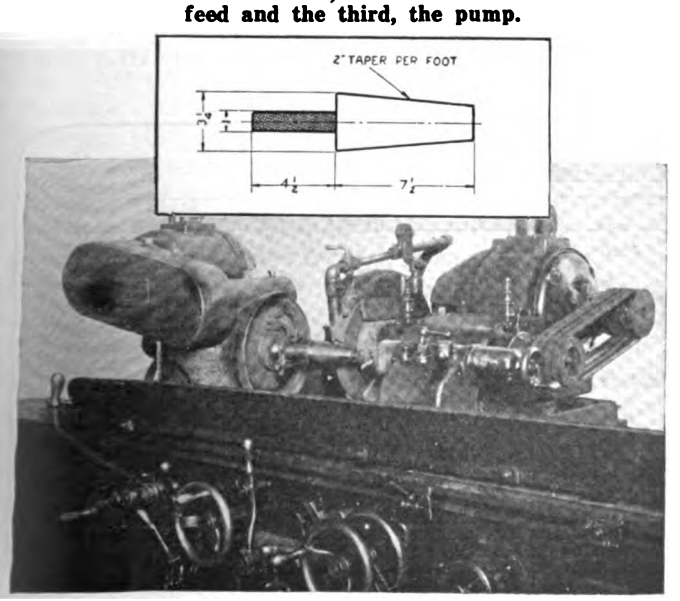
. Plunge-cutting pipe balls
rate of eleven minutes
iece. The material is
anganese steel.

and finish grinding in one operation, from the rough casting. The material is manganese steel and .150" stock is removed. This gives a thorough finish and limits are held to round within .010", straight within .010" and size within .010". This machine is a 16" x 22" x 36" Cincinnati Self-Contained Plain Grinding Machine and the wheel is a 20" diameter by 2" face by 12" hole. It is Aloxite grain 30, grade G, Bond 64 as produced by well-known manufacturers. The former time taken to grind these 9" diameter pipe balls was 20 minutes—on this machine the low time of 11 minutes per piece, floor to floor was obtained. A wide variety of balls up to 22" in diameter are handled. All of the rigidity of power in this heavy Duty Grinder is utilized in taking the heavy cut on these manganese steel balls, which are ground from the rough. There are numerous high spots which make it necessary to set the ball properly for true running while grinding. An aligning fixture is used when setting the pipe balls on the mandrel, for this purpose. The pipe ball is passed back and forth before the cutting face of the grinding wheel. The wheel is fed in either mechanically or by hand, according to the skill of the operator and the roughness of the ball, but the operator does not true the wheel. He uses it until it is worn to a stub, when it is discarded and replaced. No steady rests are used to support the work. This entire equipment is one to give extreme rigidity and heavy grinding cuts.

One of the most interesting installations recently performed is that shown in Fig. 5. It is a machine used for grinding rolls for producing foil. The material is hardened steel and the operation is that of grinding all cylindrical surfaces. Stock removal depends on the wear which has taken place on the roll. The roll diameters, one roll with its mate, must be within limits of .0002" of the same size, illustrating the unusual accuracy which is obtained on this machine. One roll is now ground in less than half the time previously required. This gives an unblemished finish. The machine is equipped with a wobbler driving device. Roll Crowning Attachment and a Mirror Attachment. Foil sheets .0035" thick are produced on these rolls which have been ground with an extremely high finish direct from the grinding wheel in approximately one-half the

(Continued on page 40)

Fig. 6. Three individual motors are used on this machine which is grinding a taper plug. One drives the wheel head, another the table feed and the third, the pump.



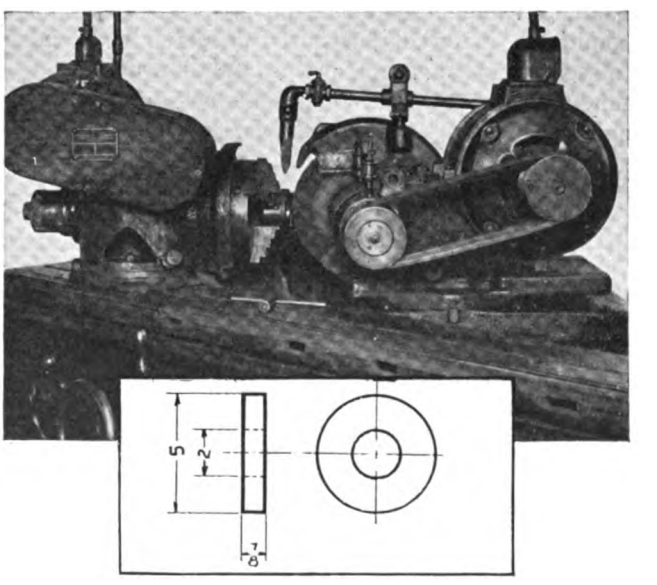


Fig. 7. By means of the swivel wheel head, the face and edge of this thrust ring can be ground at one set-up.

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The Purchase CONTROL of Stores

By S. Craig Alexander

In this article, the second of a series on "The Mechanism of Buying" by Mr. Alexander, he emphasizes the importance of the purchasing agent's part in forecasting and budgeting the acquisition of stores so as to maintain the most efficient inventory.

THE CONTROL of stores is an important subject to industry. It is also a broad subject, and presents a number of aspects. In this article we shall consider it primarily in relation to its purchase control, including the necessity for proper coördination with the other activities of the business, its importance from the standpoint of finances, the preparation and use of the purchasing forecast and materials purchase budget, and the mechanism of control, but excluding methods of receiving and inspecting, storing, manufacturing for stores, methods of distribution, and problems more properly accounting.

Coordination of Different Activities

Proper control of stores involves coördination with the production, financial, and purchasing activities of the business. Production activities depend in turn upon the actual or anticipated volume of sales. From the production standpoint, material of the right quality in the right quantity must be available when required. From the financial standpoint, the inventory should be kept as low as practicable to minimize capital investment, reduce insurance and taxes, increase turnover, and reduce dead stocks. From the purchasing standpoint, advantage should be taken of favorable market conditions, materials purchased in lots of sufficient size to secure most favorable prices, and allowance made for time required to procure materials, possibilities of shortages in the markets, shutdowns, strikes, etc.

The net resulting situation is that the inventory should be kept as low as practicable to yet have materials available when needed, and as active as possible, replenishments being made in the minimum quantity for economical purchase as frequently as may be necessary to keep deliveries ahead of requirements, with due consideration to the rate of consumption, time required for procurement, and market and economic conditions. As the rate of consumption and market and economic conditions will vary, the system must have a certain amount of flexibility. This entails certain definite working bases for basic control, with provision to care for variations from basic conditions. The ideal situation would be where materials were delivered only as required. There are a few organizations that approach this ideal, but it is impossible for the average company.

Responsibility for Materials Control

There has been much argument as to who should have control of and be responsible for stores. In different plants, the production manager, the financial manager, the stores manager, the purchasing agent, and the plant superintendent have been placed in control. With industries ranging from those in which stores cover only supplies for the upkeep of machinery utilizing natural resources for raw materials to those in which they comprise everything in raw materials and supplies used by the company, it is difficult to lay down hard and fast rules. In general, however, we can say that stores

STORES SPECIFICATIONS

PACKING and PIPE COVERING - Group #76

Description	Size	Unit	Stock Number
Packing - Garlock - #150	1/4"	Lbs.	83180
	5/16"		83230
	3/8"		83280
	7/16"		83330
	1/2"		83380
	9/16"		83430
	5/8"		83490
Packing - Garlock - #262	1/4"	Lbs.	84180
	5/16"		84230
	3/8"		84280
	7/16"		84330
	1/2"		84380
	9/16"		84430
	5/8"		84490
	3/4"		84600

Group	Material	Series
76	Packing - Garlock - #150 & #262	83,000 & 84,000

Fig. 1. A sheet from a loose-leaf visible Stores Specifications Book.

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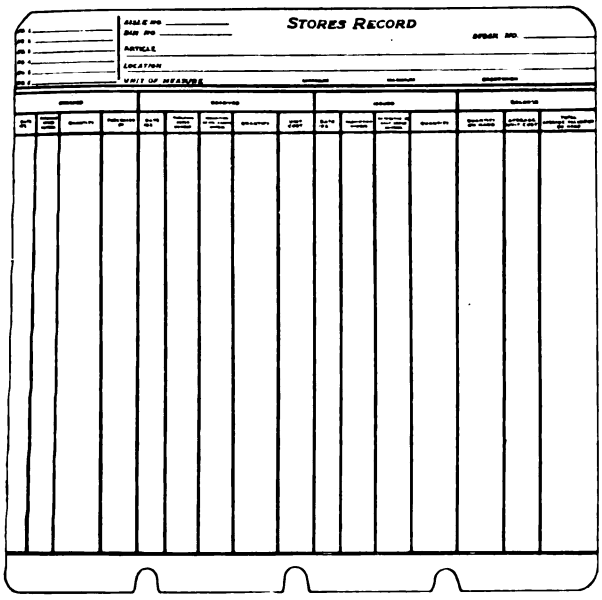


Fig. 2. A stores record form for use with accounting or bookkeeping machine.

and purchasing are but two divisions of one function, and properly should be combined under one head. A good arrangement where conditions justify it is a competent executive in charge of the combined function with sub-officials under him in charge of each division. When organized as an independent function, the production manager is relieved of the responsibility, and can devote his entire time to production and plant problems. Also the combination insures better coordination of the two, and permits of closer financial control. Regardless of who is given the responsibility and authority, however, his authority should be definitely defined and established, and he should work always in the closest harmony and cooperation with the other activities of the company.

Purchasing Forecast and Materials Purchase Budget

A growing method for the purchase control of stores is by means of the purchasing forecast and materials purchase budget. The extent to which this can be employed varies with the character of the concern. Many continuous or repetitive process concerns can be closely budgeted far in advance of operations. Jobbing shops, on the contrary, present a more difficult and restricted proposition.

Methods for preparing the purchasing forecast vary. In some concerns, each department forecasts its requirements for the projected period, and these separate forecasts are assembled, checked, and combined to form a general materials forecast. In other concerns, the stores manager; in others, the accounting department; and in still others the planning department prepares it. It is prepared, depending upon particular conditions, from past records with due consideration to past and anticipated activities, from bills of materials for jobs in order, and from standard bills of materials covering anticipated production. It involves two aspects, determination of the totals to be purchased, and the rate at which purchases or deliveries will be made. It is made up variously by jobs, departments, divisions or stations, or by combination of these. Allowance is made for stores on hand at the beginning of the period and what is desired shall be on hand at its close.

Upon completion, the purchasing forecast is placed before the financial manager or budget committee for approval. Upon approval, it becomes the materials purchase budget. Control is so exercised that departures in actual operations of any moment are immediately called to the attention of the financial manager or the budget committee that they may take whatever steps are necessary either to correct the conditions or revise the budget. The budget is subject to revision by the financial manager or budget committee when necessary, and so has a certain amount of flexibility, and it can be kept ahead of operations by advancing it periodically where it is desired to do so.

Basic Information Necessary for Control

The inventory must be kept low. Materials must be available when needed. Deliveries must be kept ahead of requirements. For the proper carrying out of the details of control to secure this, certain basic information is necessary. This includes: (1) the estimated consumption of each class or kind over a period, (2) quantities of each class or kind on hand, (3) quantities on order, (4) whether or not shipped, (5) time required for procurement, (6) maximum and minimum limits to carry, (7) amount to order, (8) quality or grade of each kind to order, and (9) actual receipts and disbursements.

The Mechanism of Control

This information is ascertained and kept up-to-date, and detail control exercised by means of proper records, organization, and routine. For proper control, records must be adequate and centralized, and properly and accurately kept. The organization and routine must be such as to insure this will be done.

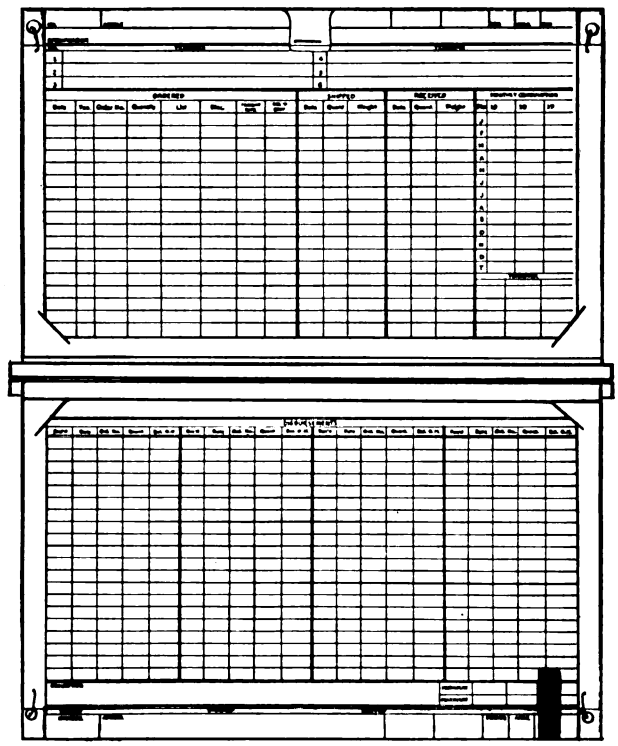


Fig. 3. A two-card visible stock-control record for use in cabinet form.

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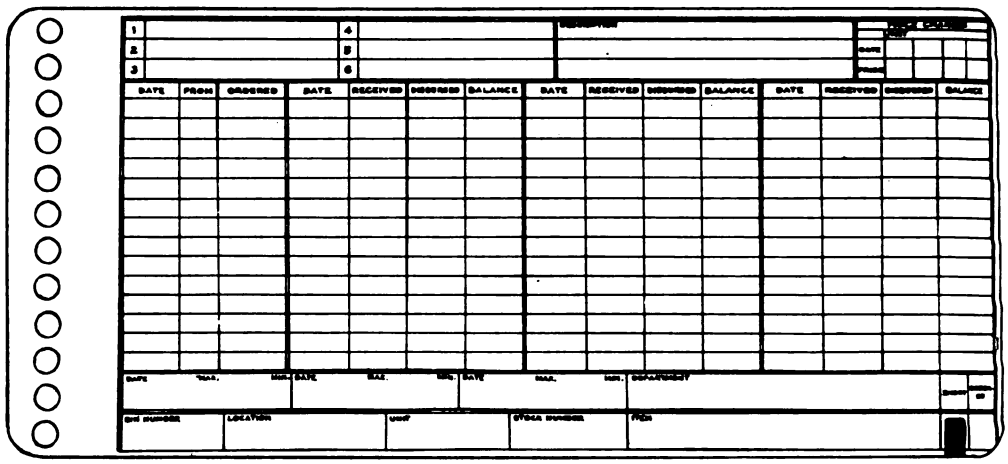


Fig. 4. A single-sheet visible stock-control record for use in loose-leaf visible binder.

There are many methods for keeping the detail stock-records. These include: (1) loose-leaf book by hand, (2) loose cards in trays, by hand, (3) loose-leaf book by accounting or bookkeeping machines, (4) visible-card-records in cabinets, and (5) loose-leaf-visible book by hand. Each of these methods has many possible different forms. The leaves for the loose-leaf book when used with accounting or bookkeeping machine are notched at the bottom to slip around the binder posts and at the same time facilitate withdrawal for insertion in the machine when the binder is unlocked. Where many books are required, a convenient arrangement is a revolving table of a convenient height for the operator when seated at the machine, the binders being arranged around the table in stands ready for operation. Sheets can be arranged in groups, and either alphabetically or numerically within the group to facilitate location. Systems of this kind carry both quantity and value totals on the individual item sheets. A satisfactory arrangement with either the visible-card-record or the loose-leaf-visible system is combination with tabulating machines to control by groups. Controlling accounts by groups in the stores ledgers for valuation totals work in well with the purchase forecast and materials purchase budget.

There are two general methods of inventory control, the perpetual and the semi-perpetual method. With the perpetual inventory method, the periodic count is merely to confirm the record. With the semi-perpetual inventory method, the periodic count is a necessary part of the system. By this method, to ascertain consumption for a period, to the stock on hand at the beginning is added the receipts and from the total is taken the count at the end. The difference is the consumption. The perpetual inventory is the closer method of control and is to be preferred where it can be used. Sometimes a combination of the two methods is used. Large items and unbroken packages then are carried in the perpetual and broken packages in the semi-perpetual inventory manner.

Detail stock-records may be kept by quantities only, or by both quantities and values. The latter method is preferable. In some systems quantity balances and unit costs are carried on the individual card, and in others both quantity and valuation balances are carried.

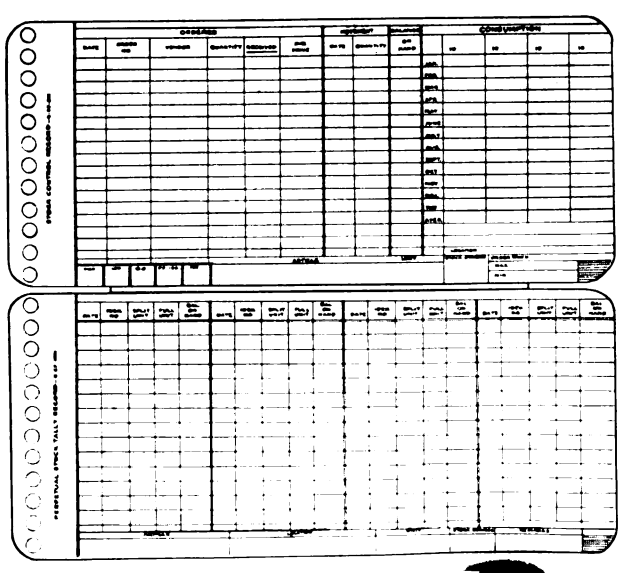


Fig. 5. A two-sheet visible st record for use in loose-leaf

The Several Constituents of Control

The stores control machine considered as a whole presents a rather complicated and formidable picture. By breaking it up, and considering a little at a time, however, we can simplify our study of it considerably. The following classification should help us in this study:

1. Quality, standards, and specifications.
2. Classification and symbolization.
3. Quantity and time.
4. Inventory investment and turnover.

Quality, Standards, and Specifications. Determination of proper quality, establishment of standards, and development of specifications come as the result of experiences in the use of the article, or as a result of tests or study. When an article has proven best for a particular purpose, it is made a standard, and incorporated in the Book of Plant Standards. Standards are subject to revision as better articles for the purpose are proven. Standards also are made to reduce the number of sizes or varieties of a class to facilitate production, reduce the number of items it is necessary to stock, permit carrying a righer factor of safety in stores items with reduction in the total inventory, and as an aid to purchasing. Specifications are prepared after standards have been determined to insure duplication of quality and the maintenance of standards, and after approval are incorporated in the Plant Specifications Book. Copies of both the Standards and Specifications

(Continued on page 42)

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Six Power Saving Points in Planning a Group Drive

By Robert W. Drake

Consulting Engineer, International Harvester Co., McCormick Works



Fig. 1. This is a hard drive and calls for exceptionally stout transmission and belting. The machines are planing stone.

THE planning of a group drive is seemingly so simple a matter that the overloaded plant engineer frequently leaves it to the boss millwright. In ery capable hands he leaves it too, for the boss millright just must be a competent man, or his shortcomgs soon advertise themselves so unmistakably as to intolerable. In these days of close coupled progressive anufacturing and progressive assembly, the arrangeent of machinery is planned to suit that progression. nus, unlike his predecessor of thirty years ago, our end the general foreman of millwrights seldom has uch to say about the machinery layout.

If the drive is given scant consideration in determin- the machine layout, our millwright friend's lot in e will be hard. He receives an iron clad machine layout for a room full of machines which are to be group driven with instructions to "set machines as per blueprint and install drives according to your excellent judgment." From the standpoint of overhead work the muddle seems to him complete, but the confidence shown is not misplaced. After anxious days spent under high pressure, by various ingenious expedients, he evolves a number of group drives which work very well. He isn't at all satisfied with the result. He anticipates abnormally high friction losses and high maintenance expense, but he consoles himself with the certain knowledge that no one else cares much about the whole matter and plunges into the next rush job.

Now if manufacturing costs are to be kept at a minimum, machine layouts cannot be made to suit the

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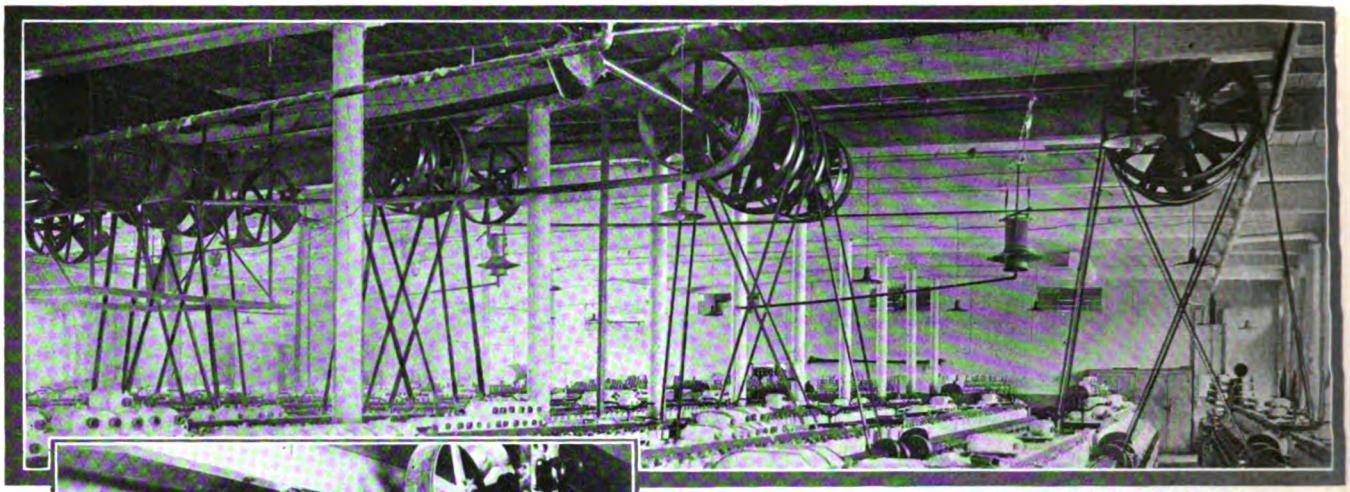


Fig. 2. This is a standard form of group drive in a cotton mill. The motor at upper left drives the jackshafts which in turn drive four frames each.

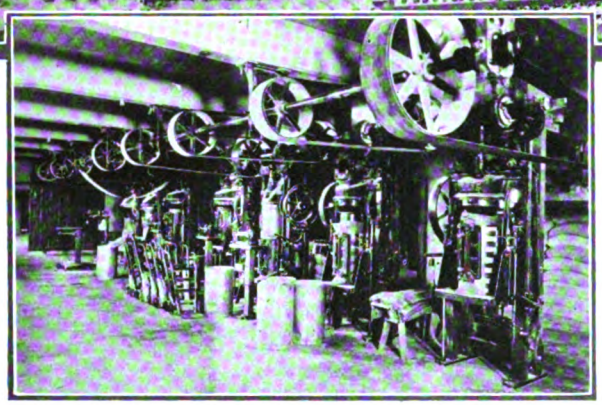


Fig. 3. Flour packing and bagging machines make heavy demands on the drive.

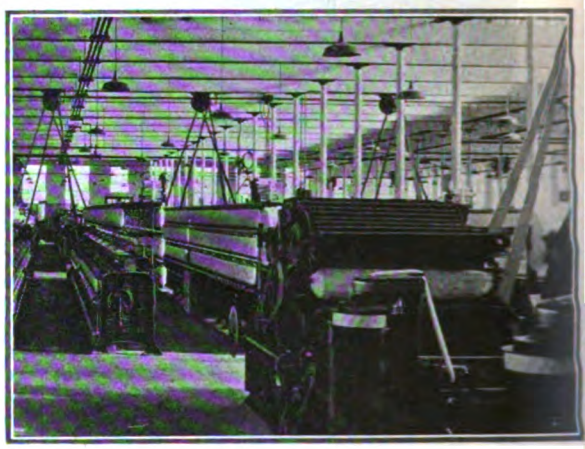


Fig. 4. Four-frame drive motors in cotton mill driving slubbers in groups of four without lineshafts or jackshafts.

mechanical transmission. Every one recognizes this. It is far less generally recognized that a little thought and care in the machine layout will almost always make worthwhile reductions in maintenance costs, friction losses, and perhaps even manufacturing delays, with no serious drawbacks so far as machine arrangement is concerned.

In well planned group drives the total power losses in mechanical transmission average from 7 per cent. to 16 per cent. In poorly planned drives the losses may reach double these proportions. Of course it is easy to find somewhere a "horrible example" which exceeds the above figures, but a group layout must be very bad indeed to exceed 30 per cent. losses, unless the total power involved is very small or the load very intermittent. It is, therefore, evident that the savings possible by giving careful consideration to the mechanical transmission, while not overwhelming, are well worthwhile. The elimination of manufacturing delays and the decrease in maintenance often exceeds the return from power saving.

In general the whole mechanical transmission layout should satisfy the following four requirements,—

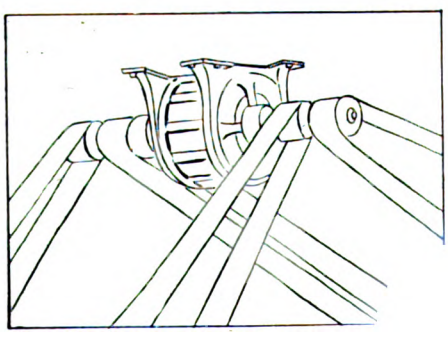


Fig. 5. This is a four-frame-drive extended shaft motor.

(1) The utmost reliability, long continuous service with least possible repair. Particularly to be avoided, are troubles which cannot be anticipated by routine inspection and maintenance. Nothing is so expensive as breakdowns in working hours.

(2) The minimum expense for necessary routine maintenance consistent with reliability and long life.

(3) Reduction in power losses to a point where further reduction will not pay a reasonable return on the necessary increase in cost.

(4) As low first cost as can be realized without sacrificing the three preceding requirements.

Size of Group

Never do all the machines in a group take the maximum power of which they are capable at the same time. Dull tools, maximum reduction in abnormally unfavorable material, etc., never occur simultaneously. This diversity and various other matters which grow out of it offers the principal reason for driving machines in groups. The degree of this diversity of loads in the group, to a large extent dictates the best size of group

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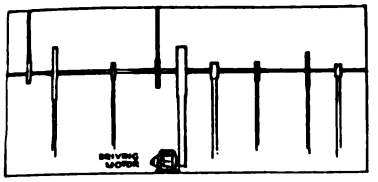


Fig. 6. The losses in a group are less if each shaft is driven by a separate motor.

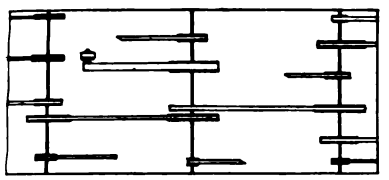


Fig. 7. Such a drive as this with several "cross" belts from shaft to shaft, involves increased losses from belt and pulley windage and hanger bearing friction.

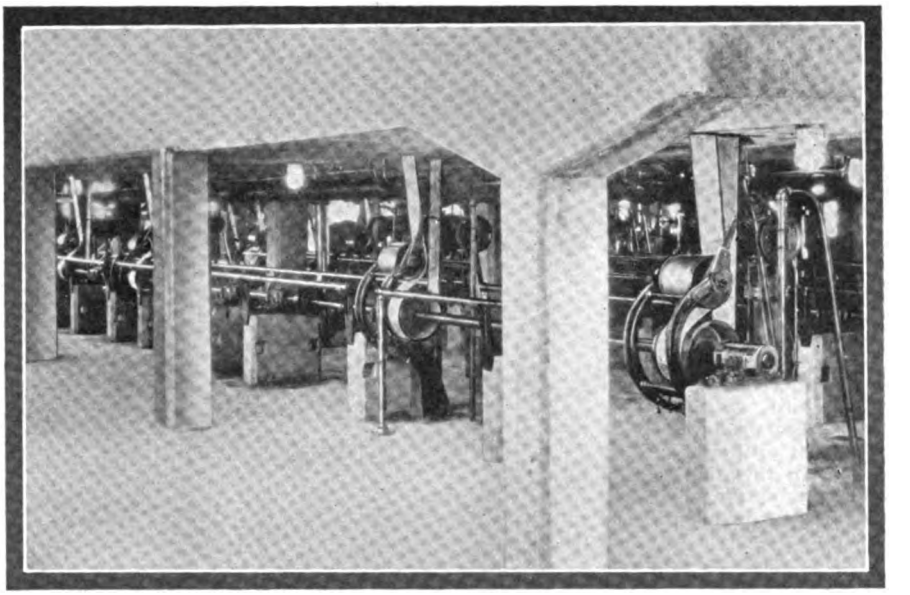


Fig. 8. Group drive in a paper mill. The counter-shaft is in the basement and drives upward through the floor. This necessitates the belt tighteners shown.

The more variable the individual machine loads the larger should be the group, other things being equal.

The ideal group drive is a group of six to twenty machines requiring a motor not larger than fifty horsepower; fifty horse power being the largest size of motor which can be conveniently handled in a hurry. For such machines as operate steadily all the year round at about the same load, the best number of machines in a group is largely a matter of convenience. One shaft the length of the room will ordinarily be the maximum. Four machines will ordinarily be the minimum. If four such machines require thirty-five horsepower or so this is a good group. Even with much smaller power demands four such machines are sometimes chosen as a group because thereby the lineshaft may be eliminated and sometimes all or part of the countershafts as well. The expedients shown in Figure No. 1 and Figure No. 2 were originally devised for driving spinning frames. They are occasionally applicable elsewhere where a number of identical machines are to be driven at rather high speed.

In a layout of dissimilar machines working on a variety of work there is a great advantage in including a considerable number of machines in a group. In such a case one shaft the length of the room would ordinarily be the minimum group, while two such shafts involving one "cross" belt will ordinarily be the maximum economical drive. Where the total load in a room is small and the power requirements of the individual machines extremely intermittent or variable, it may often be advisable to drive more than two shafts in one group if there are more than two shafts.

In general, however, "cross" belts are to be avoided. Let us consider an example,—

Figures No. 3 and No. 4 represent two arrangements for driving the same machines in the same room.

The friction in hanger bearings is roughly propor-

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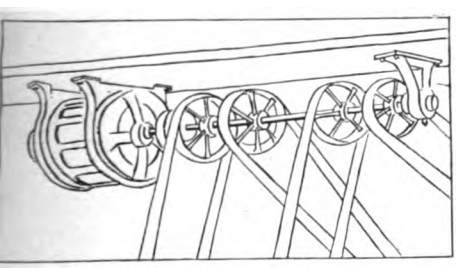


Fig. 9. This is a common four-frame-drive direct connected to the motor.

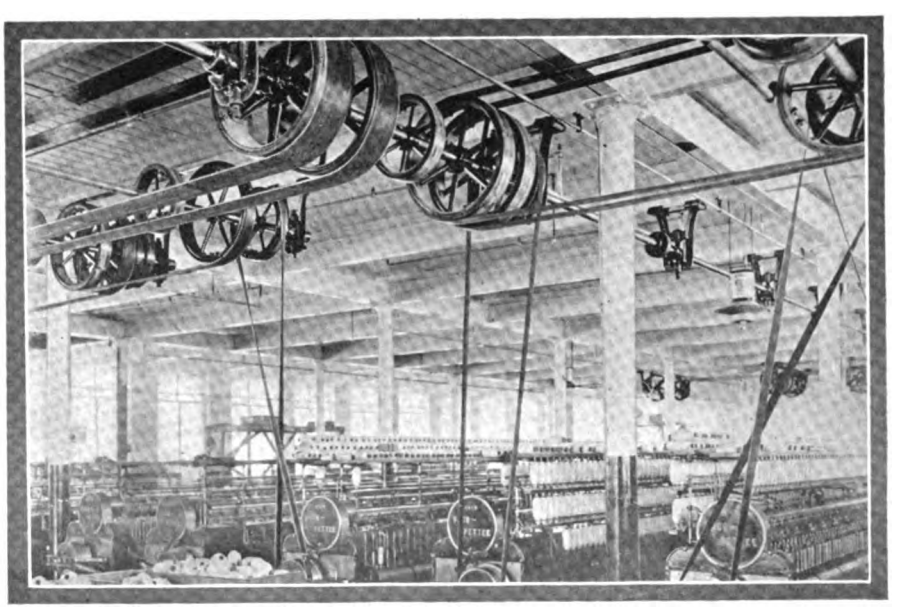


Fig. 10. Right: Standard textile mill layout of driving spinning frames, lineshafts and jack-shafts.

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Fig. 1. This is one form of reflector which, with a bulb of the proper color and reflecting mirrors, both colored and plain, produces daylight illumination. In the above lamp, a single set of mirrors is used.

Daylight Illumination *and* Color Matching

By Walter N. Polakov
Consulting Engineer



Fig. 2. This lamp is used for the same purpose as the one at the left from which it differs by having two sets of mirrors forming the sides of two pyramids.

THE importance of correct illumination in factories and work shops has attracted a great deal of attention. But, while the problem of adequate and equally distributed illumination may be considered as on the right path for solution, the problem of securing correct quality of light has not been solved until recently.

The character of light, which is the nearest approximation to the sunlight is not only extremely important from the hygienic point of view, but is absolutely indispensable in many industries, such as textiles, printing, clothing, laundry, tobacco, jewelry, and numerous others, where the process of inspection of product or material depends on correct distinction of colors and shades. Likewise, the problem of correct illumination is particularly important for hospitals, dispensaries, and general medical practice.

In the old attempt to secure an artificial approximation of daylight and sunlight, the inventors tried to correct the spectral quality of the light by employing various ray filters which would absorb the rays with longer wave, such as red and yellow. In a measure this attempt met with success, but at the expense of great loss of intensity of illumination.

The results of all of these early experiments have been sufficiently unsatisfactory to turn the inventors from the well beaten path of correcting light, by filtering through thick and heavily tinted glass, into another direction. Dr. Weiss of Vienna, has developed goggles (Farbenerkennungsbrille), with ray filtering lenses, which serve to correct the vision of those who have to work in industries requiring precise distinction of colors and shades.



Fig. 3. Here is a daylight lamp used for such delicate w surgery. There are three sets of mirror the sides of three different pyramid this is to concentrate the light circle and eliminate shadows.

Sheringham, in England, made a new start in the art. He has offered a conical reflector, which is painted inside for 66% of the area, with ultra-marine blue, and 32% emerald green, and 2% vermilion red. The latter color was necessary for the other two produced over-correction in the reflected light, creating an excess of blue and green rays. The rays of the lamp themselves were projected against the reflector by means of a non-transparent mirror placed underneath the lamp. While the idea was fundamentally sound, the practical solution of the problem presented great difficulties in securing suitable paint that would correct the rays and would reflect enough of them, and would not deteriorate under the influence of heat and light. Moreover, an apparatus of this type, using a lamp of 500 watts, emits only 60 candle-power, thus consuming roughly, 10 watts per candle power. (Elektrotechnische

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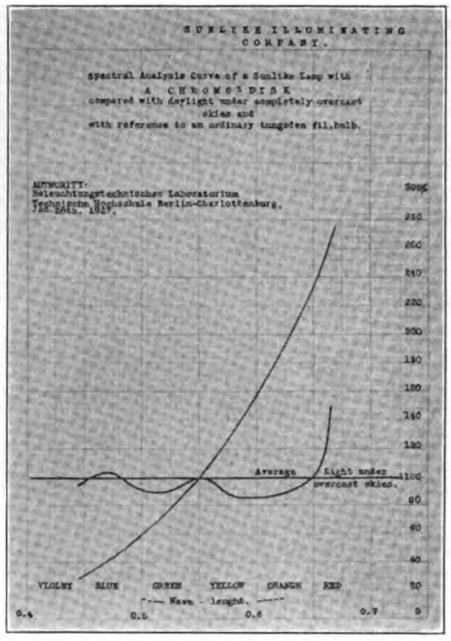


Fig. 4. The heavy horizontal line of this curve represents the color analysis of daylight with overcast skies. The serpentine line is the analysis curve for a day-light lamp and the high smooth curve is that of a tungsten filament bulb.

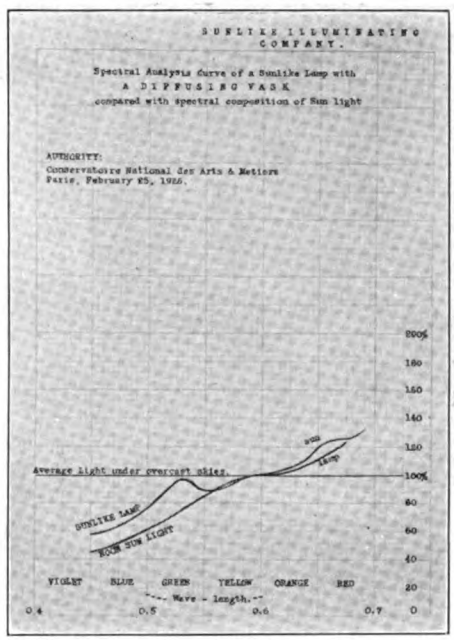


Fig. 5. The above curves indicate how closely the color analysis of the light from a daylight lamp follows that of the sun.

Zeitschrift.)

Henri Gamain, a French engineer, has successfully solved this problem by attacking it from both ends. He corrected the source of light by employing a gas-filled Tungsten bulb on a circuit of 5% higher voltage than the "normal" for the bulb. By thus sacrificing about 15% of the life of a bulb he secured a much whiter glow at a slight cost of additional replacement on bulbs. This increase of temperature of the metallic filament from 2300° C. to 2600° C. eliminates some of the red and yellow rays.

Further correction of the source of light is obtained by using a blue colored bulb, such as Philips bulbs "Solaire" or the Mazda C2 lamp, or German Bergman bulb.

The next step in correcting the spectrum of the incandescent lamp is attained, not by means of filtering through a blue glass screen as in the case of earlier lamps, but through reflection. In order to avoid such loss through absorption as observed in case of the Sheringham reflector (10 watts per candle power) Gamain employs glass colored by cobalt oxide silver-backed mirrors, especially coated to protect them from the deteriorating effect of the heat and light.

To avoid the over-correction observed in the Sheringham reflector, the mirrors are used in the various proportion, e. g., colorless, 3 blue, and 4 violet. These mirrors are placed around the source of the light, forming a pyramid and the angle at which the mirrors are located depends on the angle of diffusion of the light. With a single set of mirrors good results are obtained, with an angle of 37° 30′. (Fig. 1.) Using a multiple pyramid arrangement, the sides of the pyramids may be inclined at angles of 27°, 40°, and 66° 30′. (Fig. 2.) By changing the angles one may obtain concentration of rays instead of diffusion as is the case in the triple mirror surgical lamp, designed under direction of the noted French surgeons, Drs. D'Artigues and Pauchet. The combination of angles in this instance is such that the lamp concentrates light on a circle about 12 inches, 30



Fig. 6. An example of even illumination from lamps of the enclosed type, with metal reflectors.

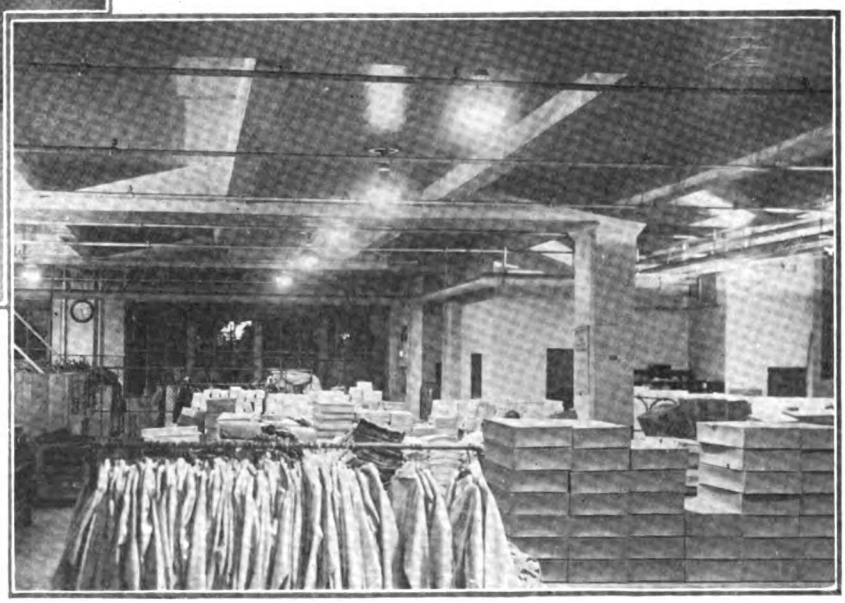


Fig. 7. Daylight lamps are at their best in department stores where color selection and color matching are essential.

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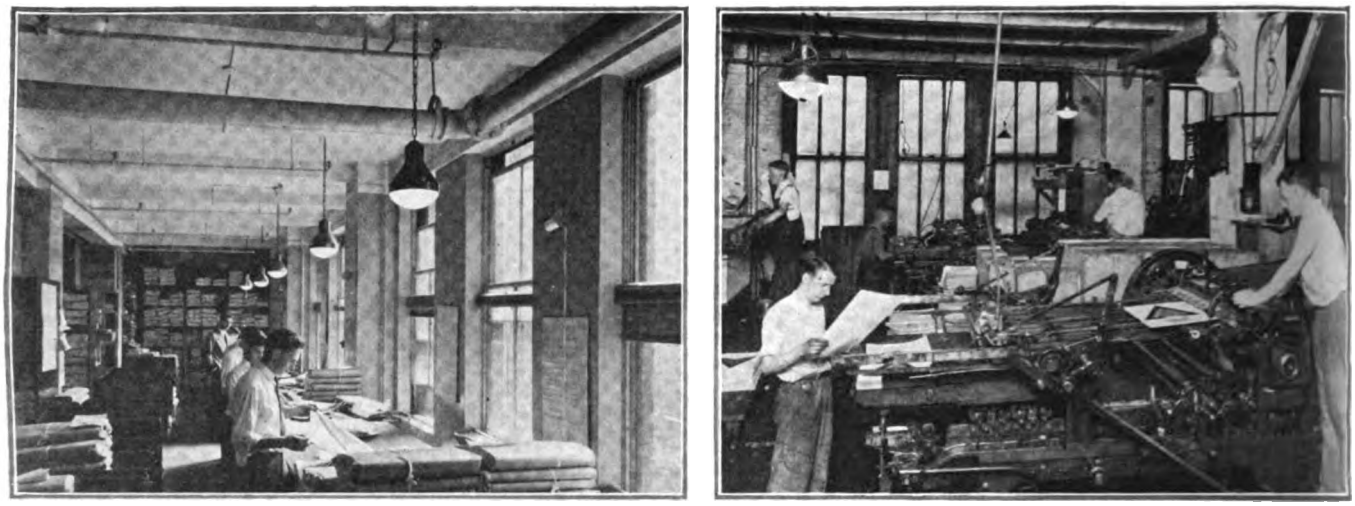


Fig. 8. Daylight lamps are actually better than daylight itself for color matching since their light remains constant while that of the sun varies during the day. Hence they are of special value in color testing laboratories, in die works, paint factories and printing plants.

c/m, in diameter, and practically eliminates the shadows of the surgeon's hands and head. (Fig. 3.)

By the employment of a graphite glass vask covering the apparatus, the light is rendered harmless and non-fatiguing to the eyes. The vask is of nearly spherical or elliptical curvature and is polished on the outside surface and frosted on the inside. This provides a soft, diffused light, with least absorption of luminosity.

Such lighting apparatus, as covered by patents*, has been thoroughly and carefully tested as to the quality of the light and the efficiency of operation. According to tests made by the Laboratorie Nationale des Arts et Metiers in 1926, as shown on Fig. 4, the light produced by the daylight lamp follows remarkably closely the curve of the spectral analysis of the noon sunlight, showing slight excess of blue and green rays, yet practically in parallel proportion, and almost identical proportion of yellow, orange, and red rays.

With substitution of the inside frosted vask by a chromo disc, the light of the same apparatus can be changed to closely approximate the diffused light under

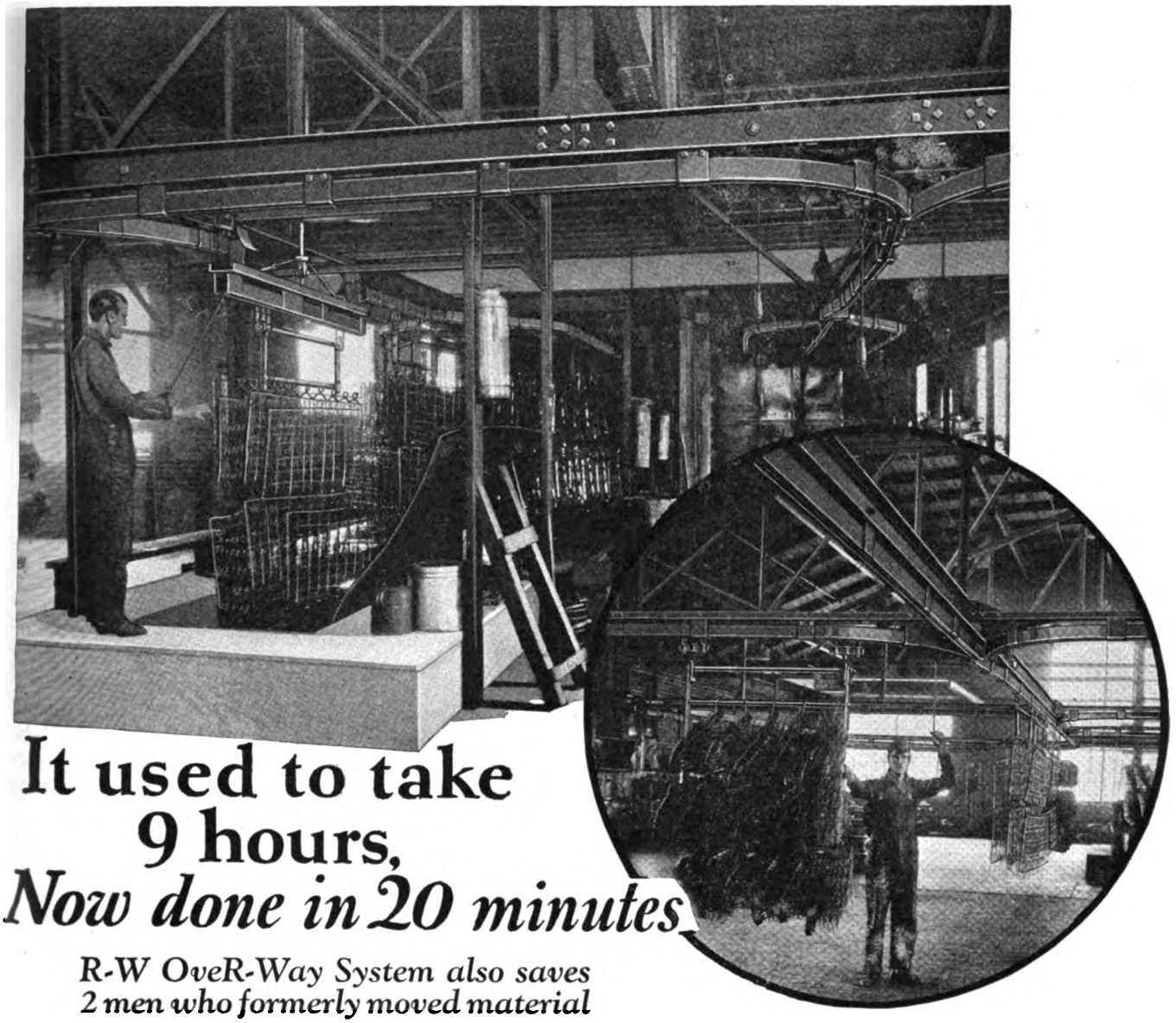
(Continued on page 52)

*French No. 556,389, Apr., 1923.
German No. 411,936, Apr. 8, 1925.
U. S. A. No. 1,519,448, Dec., 16, 1924.



Fig. 9. This ex[illegible] of jewels for comparison with manufactured colors, made [illegible]mand upon the daylight reproduction qualities of the [illegible]lts, however, were entirely satisfactory.

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It used to take 9 hours, *Now done in 20 minutes*

R-W OveR-Way System also saves 2 men who formerly moved material

E. W. Greeno, President The C. L. Greeno Company, Cincinnati, says:

"The Richards-Wilcox OveR-Way System installed when our Cincinnati factory was built in 1921, has been added to so that at present we have over 1000 ft. of track, reaching every part of our factory and shipping room. As our springs and spring seat frames are made, they are hung on carriers, suspended from two R-W Ball-Bearing Trolleys, which they never leave until they reach the shipping room.

"Before the OveR-Way system was installed, enameling was such hard, dirty work that it was difficult to keep men on the job. In consequence, the enameling could not keep up with the manufacturing.

"Now one man sends the loaded carriers through the tempering oven where they are heated to 600°, lowers track, carriers, and load into the dipping tank, and then puts them in the baking oven—doing in 20 minutes what it formerly took three men three hours to do. The R-W OveR-Way System also saves two men who formerly moved material.

"The OveR-Way System, together with the efficient layout of the plant, has increased our capacity about 200%, with practically no extra machinery and less labor. It has made our work continuous instead of coming in batches, saved the cost of at least one additional oven, and reduced material handling to two operations.

"The OveR-Way System has given no mechanical trouble, required no replacements, and needed no maintenance except oiling trolleys and switches.

"Saving four men—about $5000 a year—as well as the investment and operating cost of another baking oven, the OveR-Way System pays for itself every two years. We feel that we could not operate without it."

R-W Engineers are experts on industrial doorways and conveying systems. They will gladly make an analysis of your plant requirements without cost to you. Just write our nearest service branch

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides"

New York · · · **AURORA, ILLINOIS, U.S.A.** · · · Chicago

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Interesting Applications of SILENT CHAIN DRIVES

By F. C. Eibell

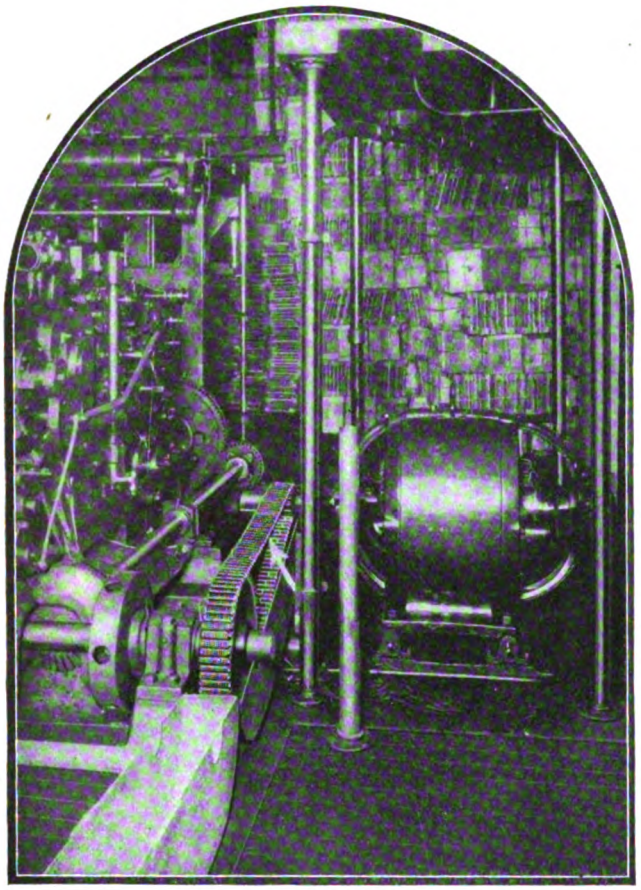


Fig. 1. One of two specially built high speed Telephone Book presses driven by a 25 hp., 1,200 r.p.m. motor. They operate 24 hours a day, 7 days a week, for 8 months of the year. The silent chain drives were installed two years ago. They are 3-inch chains on 36-inch centers and are the main drives for these presses.

FREQUENTLY we find that old proverb: "Necessity is the mother of invention," bringing about improved conditions in our daily manufacturing life. Such is the story of the development of silent chain drives. No sooner had the electric motor established itself as a dependable power unit than engineers saw the advantages of individual drives. But electric motors operate at relatively high speeds as compared to the machines they drive, and to provide the necessary speed reduction with positive, efficient operation, a new power transmission medium needed to be devised. The mechanical power transmission unit that met this need is known today as the silent chain drive.

There still remains throughout industry many relics of former days when steam engines transmitted their power through a maze of line-shafts, countershafts, and belts to the machines they operate.

When these installations were made, this was the best way known to turn the wheels. Times have changed, however. Modern engineering has proved the efficiency, economy, and desirability of individually motor-driven machines, and silent chain drives are the connecting media that have made the individual motor drive a practical, operating reality.

The advantages of silent chain drives are many. The very nature of their operation assures a positive driver which at first caused much apprehension among machinery builders and users. They felt that were a machine to jam, both machines and work would be ruined. But the chain manufacturers designed shearing pins and slip sprockets which effectively eliminate any possibility of this happening.

Another advantage of silent chain drives is the smooth transmission of power that they afford. The power goes from the motor to the machine at uniform velocity. There is no pulsating action for the operation is that of an endless flexible gear rack.

Quietness of operation is another feature. There is no grinding noise, no slapping, and no generation of static with its bothersome snapping.

One great advantage that cannot be overlooked is the long life which silent chain drives possess. They are usually made of alloy steels, with teeth accurately cut, and carefully heat-treated. It is not unusual to run across an installation that has been operating for many years.

The attitude that "they work fine on this machine, but my problem is entirely different," has been frequently taken by prospective users of silent chain drives This old bugaboo of

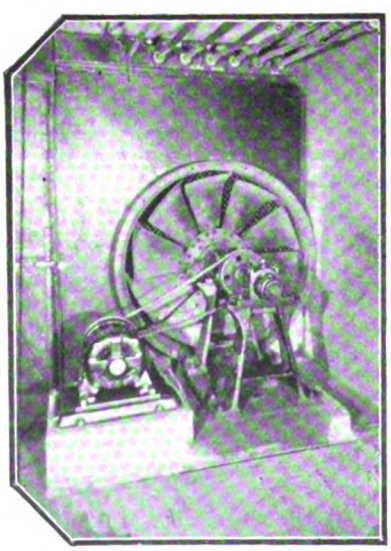


Fig. 2. Ventilation is a matter of vital importance in many industries. The operation of fans must be constant a... Silent chain drives ha... ir usefulness f... ork.

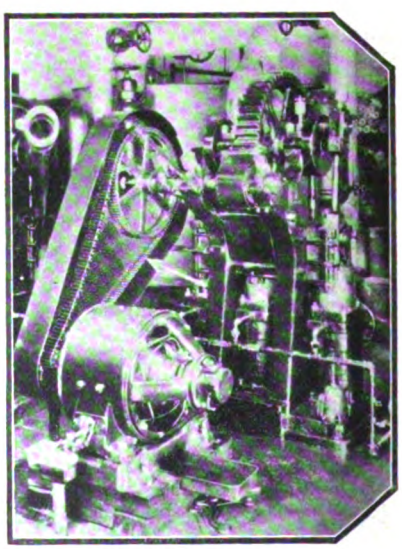


Fig. 3. This silent chain drive has been in use five years transmitting power from 50-hp. motor to a pump furnishing 2,800 lb. pressure per square inch for hydraulic press of 350 tons capacity.

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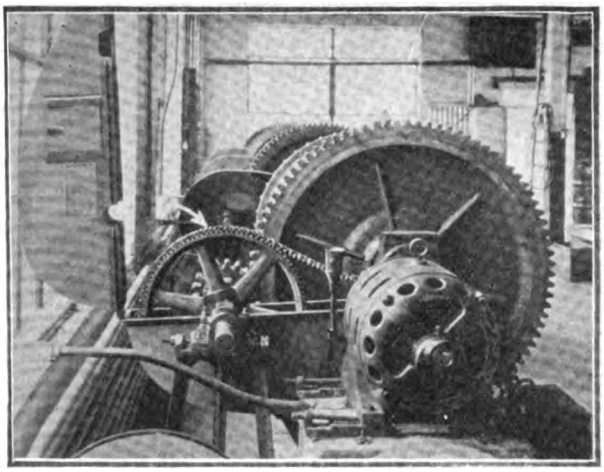


Fig. 4. A battery of pebble mills, 150 gals. capacity each, driven by 7½-hp. motors through silent chain drives on 24-inch centers.

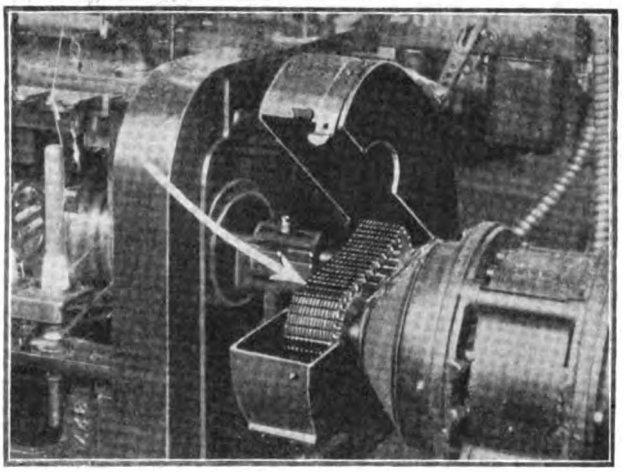


Fig. 5. Silent chain drives on 32 spinning frames in this mill. They are on very short centers with practically no reduction.

lack of adaptability has been generally exploded. The manufacturers of this type of drive have treated each installation as a separate engineering study, and the size and style of the chain recommended has been built of standard links, thus giving an individual job at a production price.

In the textile industry twisting frames, spinning frames, spoolers, knitting hosiery, and other machines are enjoying, and have enjoyed for years, the economies of silent chain drives.

As an example, the experience of a well known woolen company is typical. This manufacturer replaced belt drives with individual silent chain drives on 32 spinning frames. In spite of the fact that the initial cost of installation was higher, the individual drives paid for themselves in three years. Following is an analysis of the individual drive cost:

Motor	$177.24
Chain, Chain Case, Sprickets 1-25 Tooth, 1-37 Tooth, Bracket (est.)	$53.70
Total cost per frame	$230.94

It was found that this installation made possible an increase in production amounting to about 10 per cent.

Assuming a production of 7 hanks per day for one spindle on 30s yarn, a 208-spindle frame will produce 1,454 hanks per day, or 8.008 hanks per week, which is about 267 lbs. per week.

With a production increase of 10

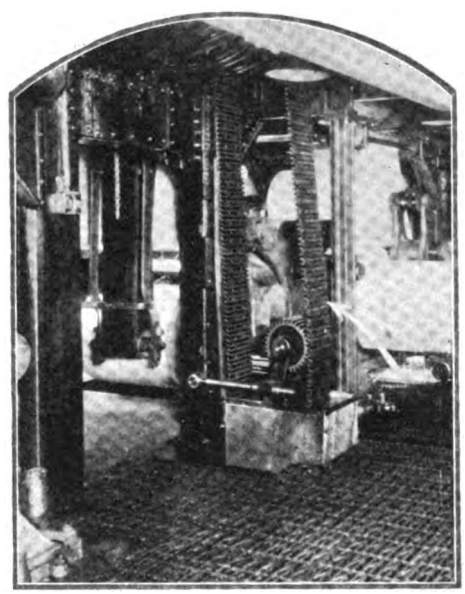


Fig. 6. M-11-16—one of 4 Goss straight line high speed sextuple presses equipped with silent chain drives. In spite of terrific speed at which the chains must work the operation is smooth and practically noiseless. These are 10-inch chains on 100-hp. motors with 128-inch centers. Driver sprocket makes 300 r.p.m., driven sprocket 300 r.p.m. This is probably the first time a vertical chain drive has been used on a newspaper press.

Fig. 7. An installation 13 years in steady use. Two pumps equipped with a silent chain drive have run 10 hours a day since 1914 without a shut-down due to chain trouble.

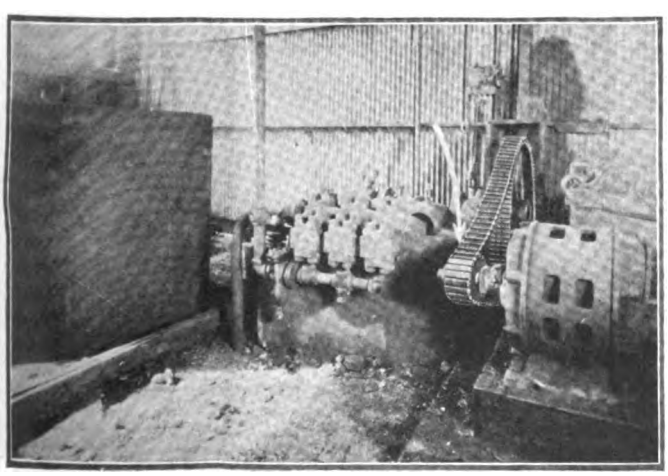
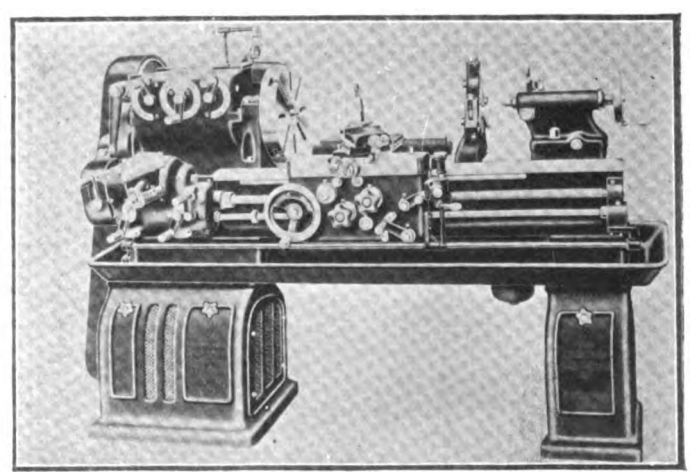


Fig. 8. One of the latest improvements in machine tools. The silent chain drive is built-in with the motor, shown at the left, as standard equipment.



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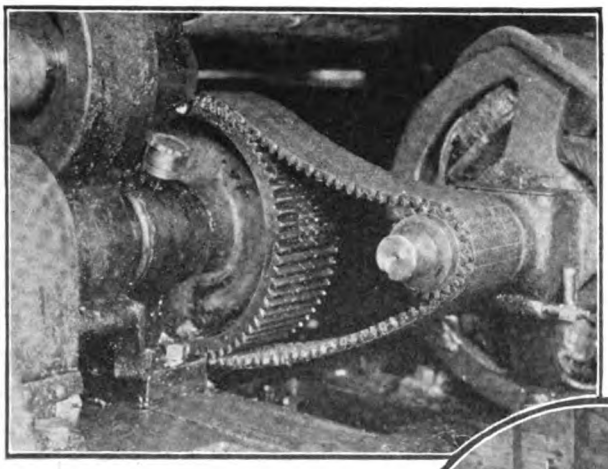


Fig. 9. 25-hp. silent chain drive operating printing press. 1,100 to 325 r.p.m. 19-inch centers.

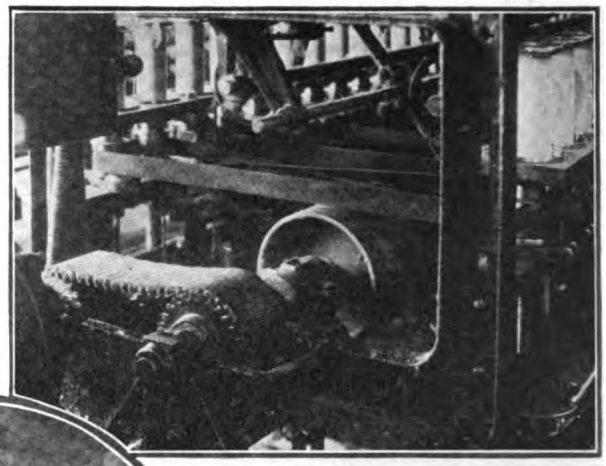


Fig. 10. Textile machinery has had both production and quality improved through the use of silent chain drives. Here we see their application to twisters.

per cent., this makes the increase in poundage per week equal to 267 x .10, or 26.7 lbs.

This multiplied by the labor and overhead cost per lb. will give the saving per frame per week. Assuming labor and overhead is 6½c. per lb., saving per frame per week equals 26.7 lbs. x .065, or $1.735.

Dividing initial cost of individual drive by this figure gives the time required for the drive to pay for itself, or 234.54 divided by 1.735 equals 135 weeks.

Hence it is seen that 32 of these individual silent chain drives pay for themselves in less than three years.

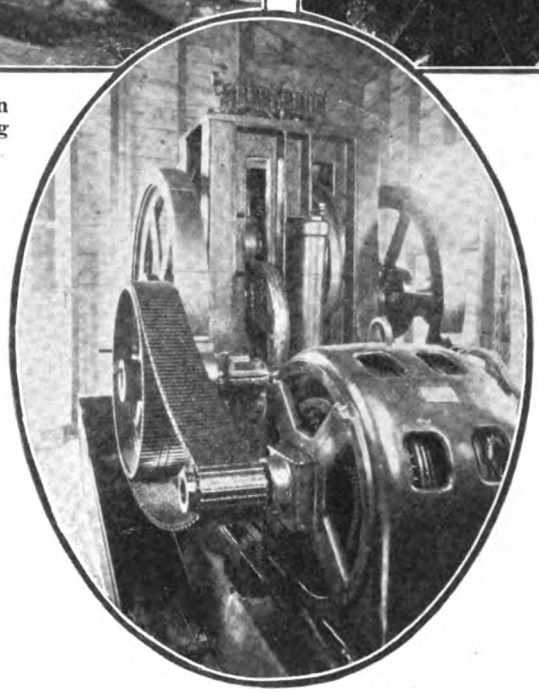


Fig. 11. Silent chain drive operating a deep well pump. This is a 25-hp. motor with a reduction of 860 to 128 r.p.m. on 36-inch centers.

In those fields where ruggedness is the chief requirement, such as on power shovels and ditch digging machines, hoist and dredges, silent chain drives have demonstrated their dependability. The automobile offers another splendid example. Here the user demands reliable, continuous, and quiet operation. There is no comparison between the sizes used in motor cars and those used on dredges, grain elevators, or rubber mill drives, yet the fundamental principles involved are the same. The suitableness of silent chain drives for these and all intermediate uses is beyond question.

The machine tool industry offers ample opportunity to study the wide adaptability of this means of power transmission. It is safe to say that there is probably no machine tool made that cannot be operated by one of these drives.

More and more, silent chains are being used as the power transmission medium for self-contained motor drives on lathes and similar pieces of equipment. They reduce vibration, and give a symmetrical, clean-cut appearance to the machine.

(Continued on page 42)

Fig. 12. To operate paper mill beaters, requires an unusually rugged drive as it is frequently subjected to overloads. There must be no slip—no irregularity.

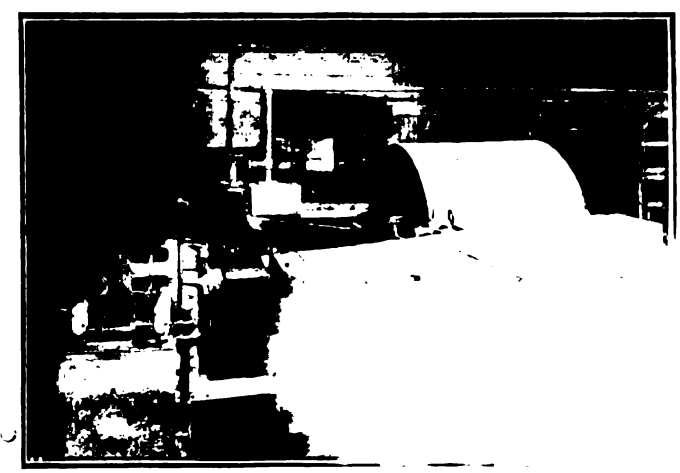
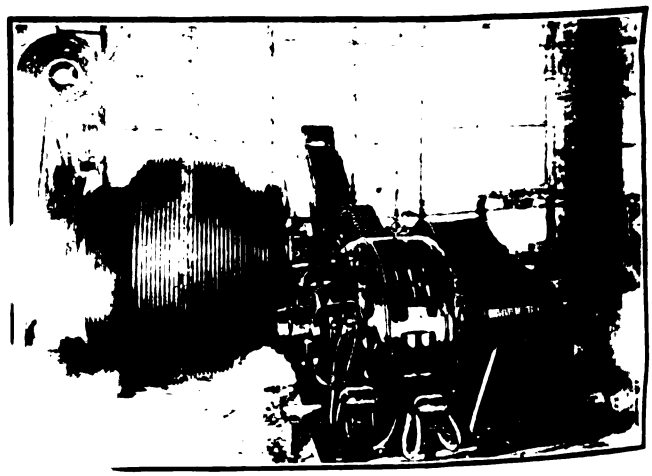


Fig. 13. Huge coal mine hoist driven by 300-hp. motor through a double reduction silent chain drive. The hoisting speed is 1,400 feet per minute.



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Fig. 1. These steel storage racks contribute materially to the efficiency secured by conveyorized assembly.

STEEL SHELVING

In the Storeroom Stops Waste of Space and Loss of Stock

By B. B. Popell

Advertising Manager, Illinois Tool Works, Chicago, Ill.

IN these days of highly competitive selling, the manufacturer must constantly be on the alert for new methods that will increase his plant's efficiency. As fast as economies are introduced, he must stand ready to weigh their value and to adopt them if he is to remain among the leaders in Industry's never-ending sales marathon. No longer can the efficient and the inefficient vie for the consumer dollar on an equal footing. The company with backwoods methods is in danger of being lost in the shuffle.

Because storage in the modern plant presents an important problem and because sheet steel shelving more and more is furnishing a happy solution, this equipment has taken a prominent place in our present day scheme of things. On the market only a comparatively short time, it has nevertheless made an auspicious entrance into the industrial world and has become a recognized factor in stock keeping.

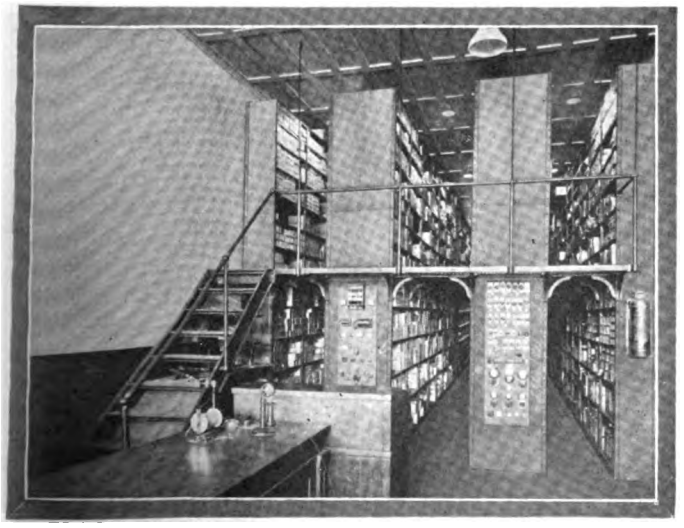


Fig. 2. Lowered fire risk is an important item in favor of steel shelving, as compared with wood.

Before the steel type made its appearance, wood was the logical material for shelving. There was plenty of lumber available at a nominal cost, and the shop carpenter always handy, so that shelves could be built on short notice, quickly and with no serious strain on the company pocketbook. Shelves were constructed as they were needed, each a certain size, with little regard for the size or type of the items to be stored on them.

Then, about twenty years ago came the first metal shelves, crudely made of angle iron and roughly finished with ordinary paint. They failed to excite the manufacturer's imagination and enthusiasm. And there was too great a price variance between the new product and the old. The low price of wood and the low labor cost in converting it to shelving made the first prices of the steel type appear high by comparison. However, conditions are changed today. Continued consumer demand and mass production have brought the prices down and improved steel shelving is now available well within the buyer's means. It is lighter in weight, attractively finished with baked-on enamel, and well constructed, with an eye toward long service.

How well this latest equipment fills our storage requirements can best be proved by actual experience. However, a study of the sales statistics shows a steady

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Fig. 3. Flexibility is an important item where storage facilities are concerned, and alterations to meet changing needs are a simple matter with modern steel shelving.

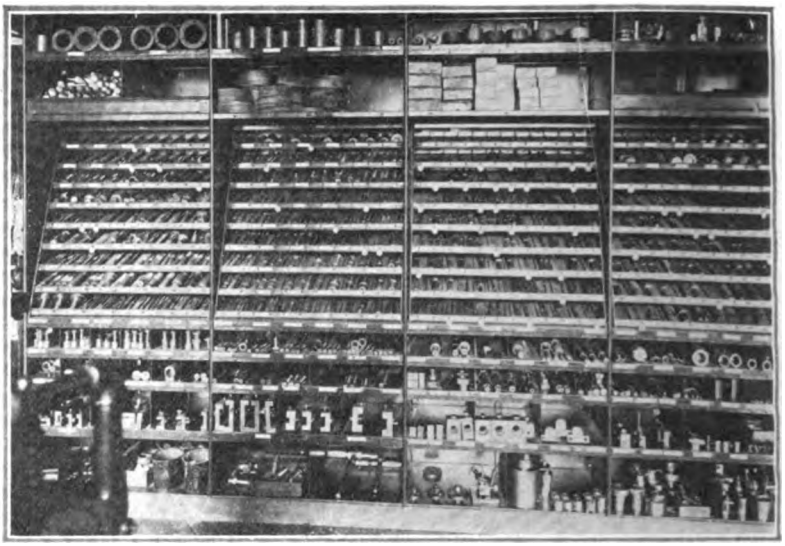


Fig. 4. A "place for everything, and everything in its place;" a striking example of orderly storage.

Fig. 5. The wear and tear on storage bins is no small factor, in the case of steel bars and parts.





Fig. 6. Where such heavy parts as pipe elbows and other plumbers' supplies must be stored in large quantities, strong shelves are a primary requirement **—and strength without bulk makes steel a logical choice.**

Fig. 7. Below: Extending across on the facing page, is an excellent illustration of a stock room for automobile parts.



increase from year to year, which would indicate a growing acceptance of steel shelving. The totals of the entire shelving industry are not available, unfortunately, since the manufacturers are not together. However, the following figures, obtained by the National Association of Steel Furniture Manufacturers in coöperation with the Bureau of Census, represent about 60 to 80% of the industry: 1921, $1,473,909; 1922, $2,459,799; 1923. $4,372,286; 1924, $5,559,659; 1925, $6,950,216; 1926. $7,340,351; 1927, to date, $3,870,691.

While the sums for the entire group would be much larger, these figures at least indicate the general trend toward sheet steel equipment.

Let us consider briefly the reasons back of this definite swing toward sheet steel storage equipment. From a dollar and cents standpoint, steel represents a most practical investment. Durable in every respect and able to withstand abuse, its depreciation is exceptionally small, so that its owner can justly place a high valuation on his equipment. At the end of a few years, his original investment is not seriously lowered, and his shelves command a high resale value.

Very important, too, is the matter of orderliness—a place for everything, everything in its place. This feature alone has won many firms over to steel. Providing a place for big items and small—enabling the owner to utilize every inch with a minimum of waste—and keeping the stock intact and separated—sheet steel shelving solves the manufacturer's stockkeeping worries with neatness and dispatch. Compare this to the disorderly arrangements of the average equipment which permits no methodical stockkeeping. Items must be placed wherever there is space, frequently making it necessary to put different objects on the same shelf. New merchandise comes in, the foreign item is pushed back and in a short time it becomes lost—at least until inventory. Who hasn't seen instances where important orders were held up until a needed item could be bought, only to discover later that it lay behind some other stock all the time?

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Fig. 8. It is not difficult to imagine the heavy and bulky wooden construction that would be necessary to support these heavy parts, in contrast to the space-saving standard steel units shown.



Fig. 9. Here is another case where steel shelving helps to speed up service in supplying motor parts and replacements.



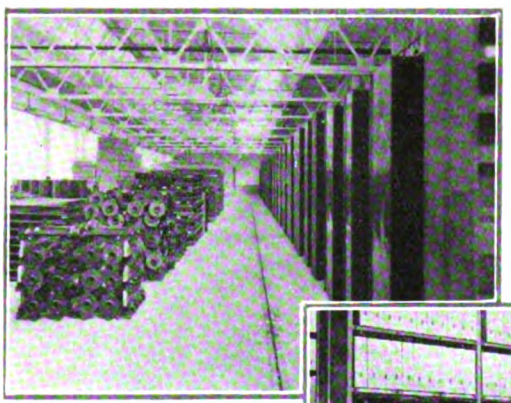


Fig. 10. Left: There is a big difference between stacking and storing, and steel shelving affords a means of minimizing the less efficient stacking of parts.



Fig. 11. Right: In this mailing room, note how steel equipment provides for every requirement.

It is well to bear in mind the time saved by systematic stock handling. No longer are employees forced to wait in line for stock, while the storekeeper gropes through mountains of hashed merchandise for a temporarily lost part. Especially is this angle important where the shop men are operating on a piece-work basis How much better for everybody concerned when requisitions can be filled promptly and efficiently!

Also, consider inventory. Who can fail to appreciate the value of a visible record for a quick check of stock on hand? By keeping everything in its place, steel shelving enables the stockkeeper to make a quick count of his merchandise. No longer need inventory taking be a period of stock upheaval and wild search for misplaced items. With these modern facilities, one or two men can check stock in only a fraction of the time formerly spent by several. Ask a stockkeeper who has been furnished with steel equipment if he would like to go back to the old type!

Then, a word about adaptability. Often a manufacturer invests in shelving only to find it inadequate at the end of a few months. Or, perhaps, he is forced to change things about. If his shelving is sheet steel, he can easily and quickly tear it down, move and reassemble it elsewhere, enlarge or reduce it.

Space economy is another feature to bear in mind. The steel sheets being considerably lighter and not as thick as wood, they afford more storage space. And the shelves may be divided at any time to permit changes in items stored so that every inch can be utilized. There is no limit to the size and variety of bins and shelves steel affords. Compare this to other equipment on which merchandise must be stored in the spaces available, resulting in stock confusion and loss of time in subsequent search. Strength is a recognized feature of the steel type. It can carry light items and heavy ones alike without danger of collapse or overturn.

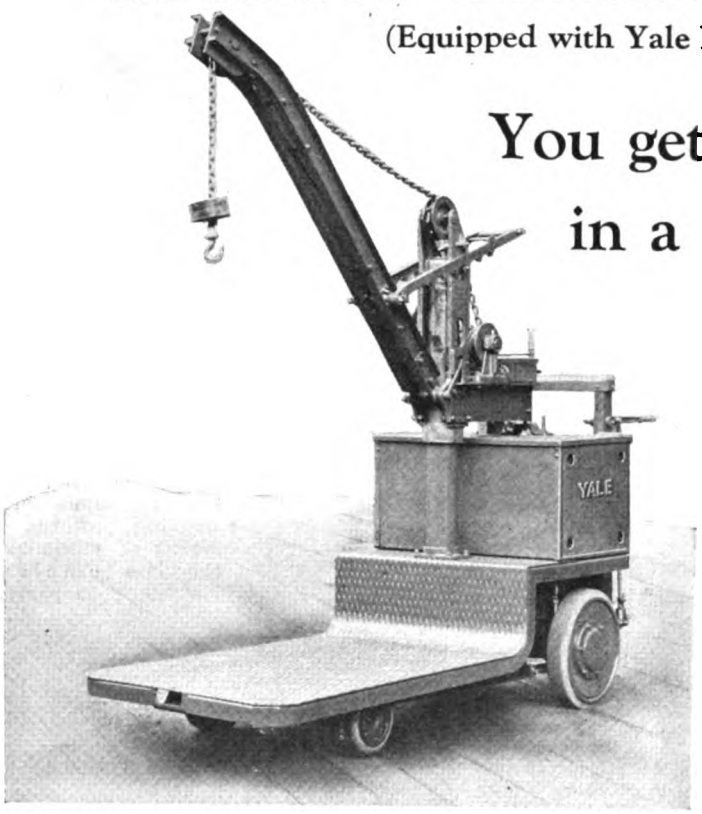
(Continued on page 54)

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TRADE **YALE** MARK

Electric Industrial Trucks

(Equipped with Yale K68 Crane)



You get Maximum Economy in a Self-loading Truck

It pays to specify Yale trucks and it pays to have them equipped with the Yale K68 Crane.

Self-loading trucks give the economy you want and must have. The Yale K68 Swinging Boom Crane manipulates the heavy loads as easily as if by hand, doing the work of several men.

Make it a point to see one of these Yale K68 Cranes in action. Watch its wide swing (over 180 degrees) in picking up and landing the load. See its remote control system. Examine its simple mechanism—steel tubular mast, structural steel boom with self-raising rack, Yale load chain and Yale standard hook—all operating at maximum speed, control and safety with minimum effort. You'll give it first rank as a genuine efficiency device for self-loading.

The YALE Line of Industrial Trucks

- Yale K20 Narrow High Platform Truck
- Yale K20E High Platform Low Lift Truck
- Yale K21 Wide High Platform Truck
- Yale K22 2-ton High Lift Truck
- Yale K23 Low Platform Truck
- Yale K23E 3-ton Low Lift Truck
- Yale K24A Three Wheel Tractor-Truck
- Yale K24B Three Wheel Heavy-Duty Tractor
- Yale K25 3-ton High Lift Truck
- Yale K26 5-ton Low Lift Truck
- Yale K67 Four-Wheel-Steer Rubber Tired Trailer
- Yale K68 Crane

Complete information available.

Write for full descriptive details of Yale K68 Cranes to equip Yale Trucks—the "key to lower transportation costs".

The Yale & Towne Manufacturing Company

Stamford, Conn., U. S. A.

YALE MARKED IS YALE MADE

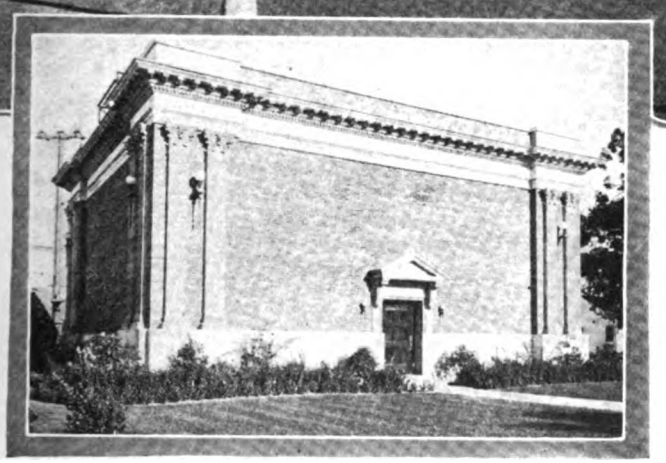
YALE **Hoisting and Conveying Systems**

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This beautiful building in its tropical setting, is hardly recognizable as a power station. Behind the glass of the arched casement windows is a blank wall for sound insulation. Reading from the top of the page, these buildings are the Melrose, West Adams and Garvanza sub-stations of the Florida Power and Light Company.





Another style of architecture adapted to the insulation of sub-stations. Here again, the windows are blind.



A still more elaborate treatment of the entirely blank walls of a power station.

Putting a Muffler on the POWER PLANT

By Leon I. Thomas

SUBSTATIONS of electric power companies must be placed in the midst of the areas they serve. Generally they are noisy--frequently so much so that they constitute a nuisance in residence neighborhoods. People naturally don't like the hum of machinery next door to their homes.

But by using extreme measures this noise has been deadened in the instance of substations in Los Angeles to such an extent that three feet from the outer walls of these buildings it is impossible to hear the slightest sound.

How is it done? In the first place each machine foundation stands by itself, not touching the surrounding concrete floor. There are no windows (those shown in the accompanying illustration are false ones added merely for architectural effect to harmonize with the residence surroundings).

(Continued on page 38)

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Sweden: The Trollhatten Falls Water Power plants and factories near Stockholm. The heavy fall of so large a volume of water is common in Scandinavia, but not so by any means in the United States.



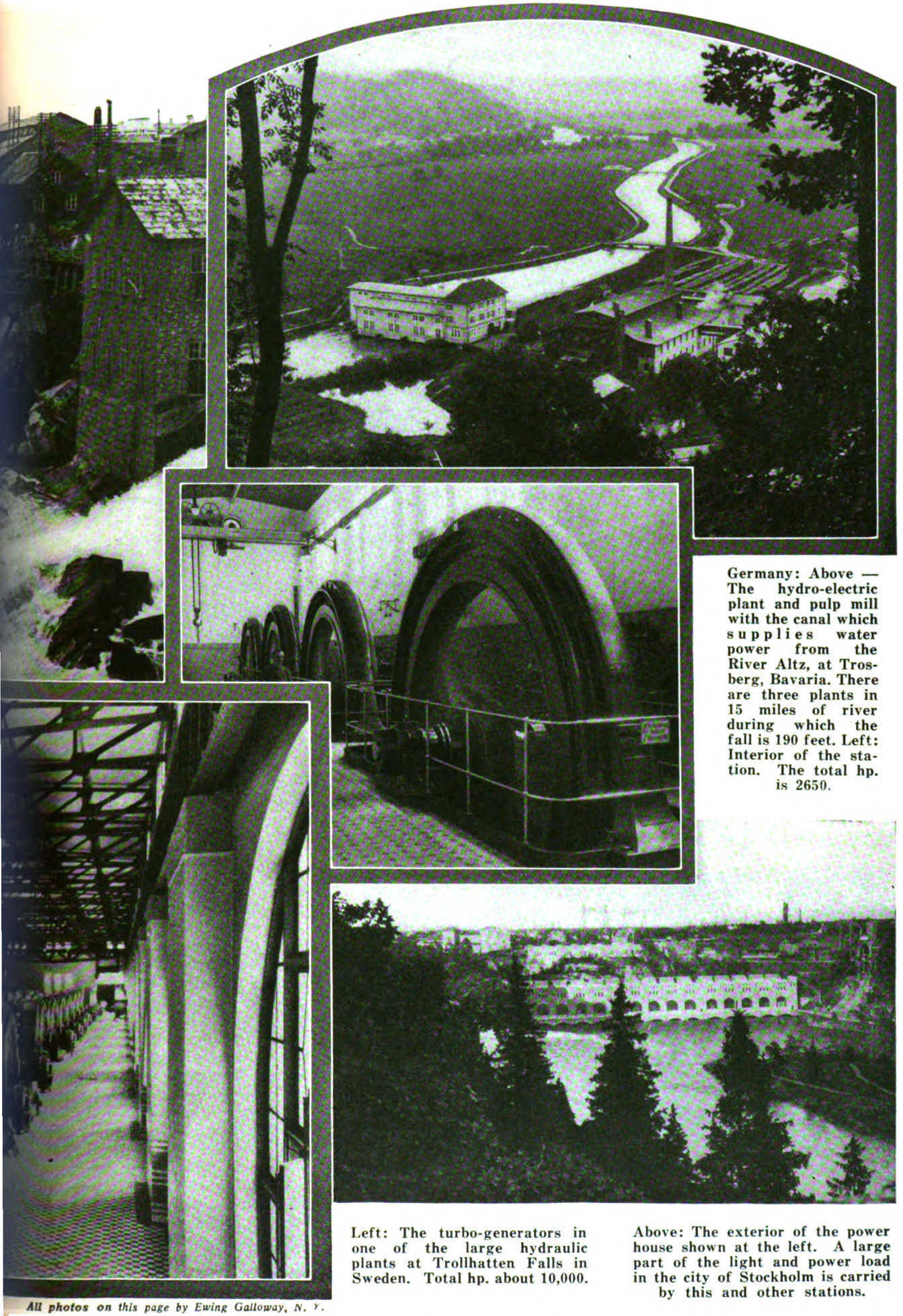
White Coal Abroad

EUROPE is far ahead of us in the development of hydro-electric power. In 1925 the total hydro-electric hp. for the continent of Europe was reported to be 32,000,000, an increase of 3,000,000 over the previous year. The records show that the total steam hp. of the United States increased from 2,000,000 in 1869 to 39,000,000 in 1926. During the same period, the total water hp. in use for manufacturing purposes increased from 1,250,000 to a little over 2,000,000.

It would appear from these figures that as the old and small water power plants in the mills were superseded by engines, larger central hydro-electric plants came into being.

Meanwhile, Europe has gone ahead with gigantic strides. In fact, the near future will see some industrial countries on the continent, Italy, in particular, wholly independent of coal for power generation. How long we shall continue to lag behind depends upon the speed with which we will convert talk into action.

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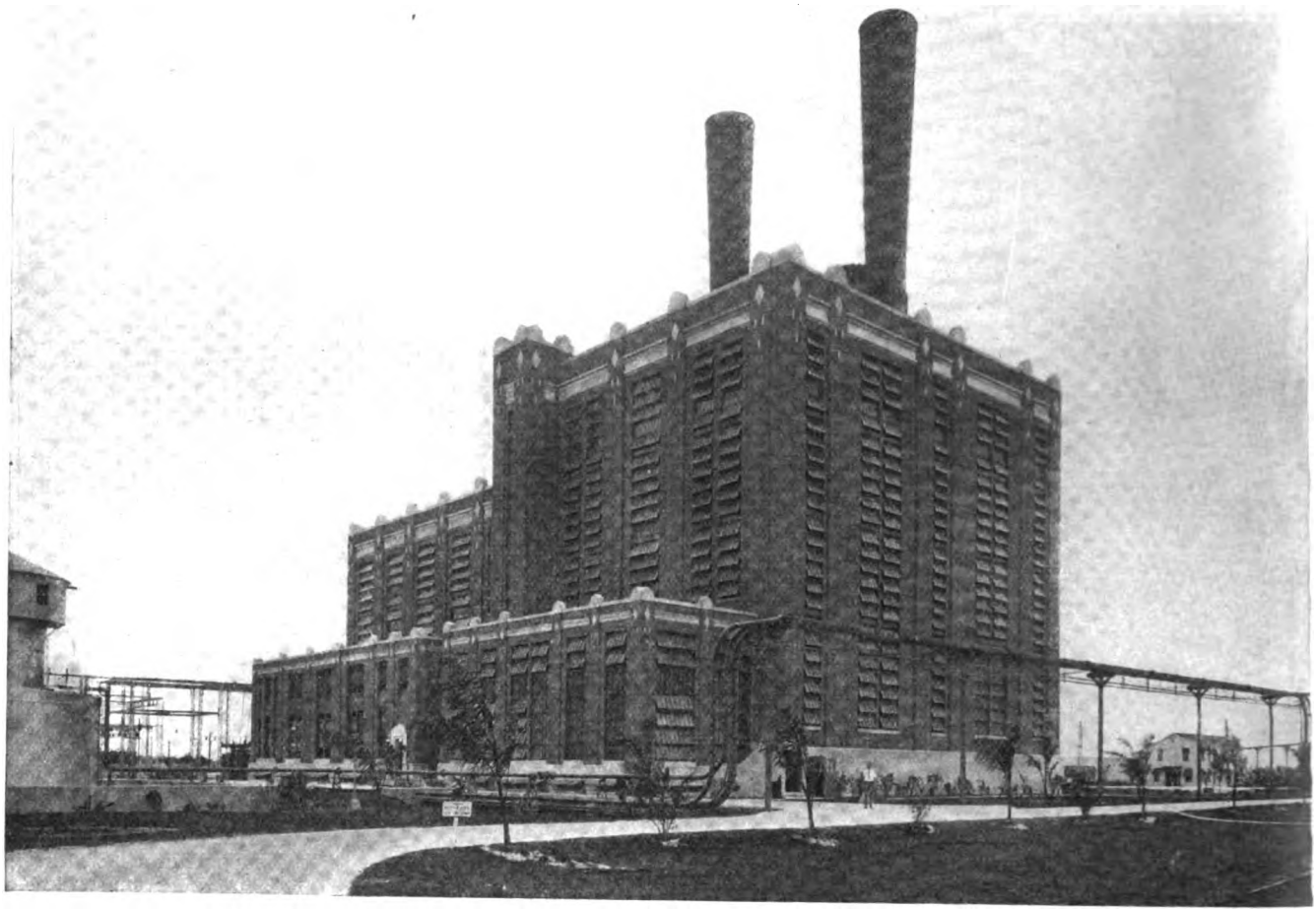
Germany: Above — The hydro-electric plant and pulp mill with the canal which supplies water power from the River Altz, at Trosberg, Bavaria. There are three plants in 15 miles of river during which the fall is 190 feet. Left: Interior of the station. The total hp. is 2650.

Left: The turbo-generators in one of the large hydraulic plants at Trollhatten Falls in Sweden. Total hp. about 10,000.

Above: The exterior of the power house shown at the left. A large part of the light and power load in the city of Stockholm is carried by this and other stations.

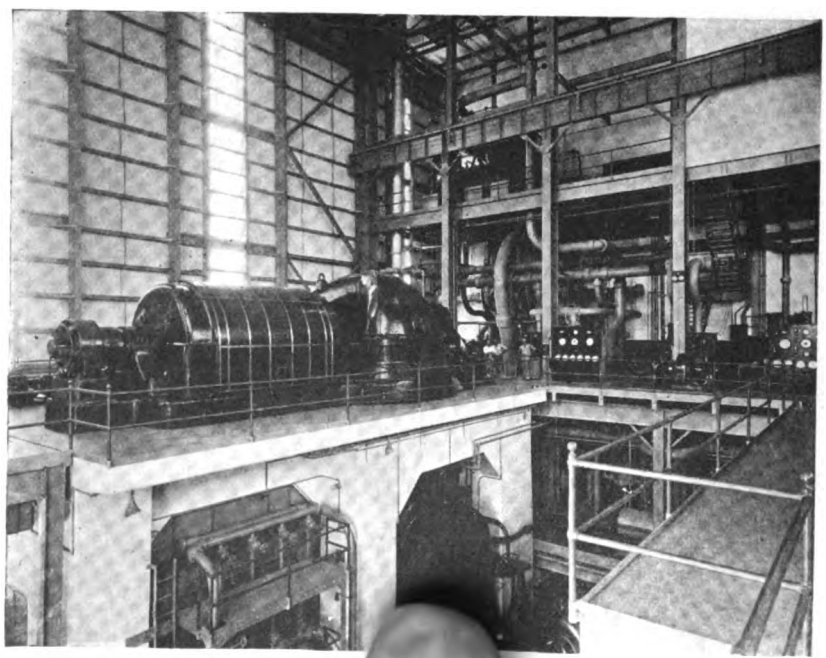
All photos on this page by Ewing Galloway, N. Y.

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The Lauderdale Station of the Florida Power and Light Co.

Central Station Equipment in the South



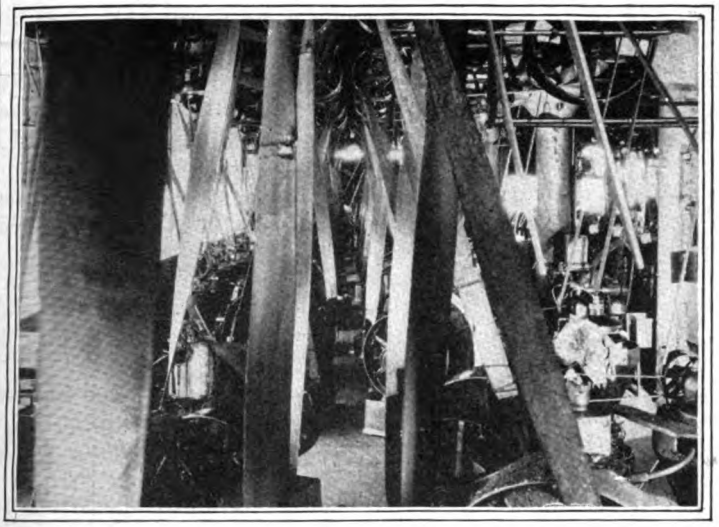
By Reginald Gordon

THE rapid development of industries and residential communities in certain parts of the South has demanded the construction of generating stations of highest efficiency.

At Lauderdale, Fla., the Florida Power & Light Co., have just completed one of three large stations that will ultimately supply electric energy over a system of 900 miles of high-voltage interconnecting lines. Three 1744-hp. boilers, operating at 375 lbs. pressure and 250 deg. F., superheat were put in to supply steam to two 25,000 k.w. generating units. The furnace walls of these boilers are completely lined with water tubes. Oil fuel is used, but provision has been made for installing a coal pulverizing plant i

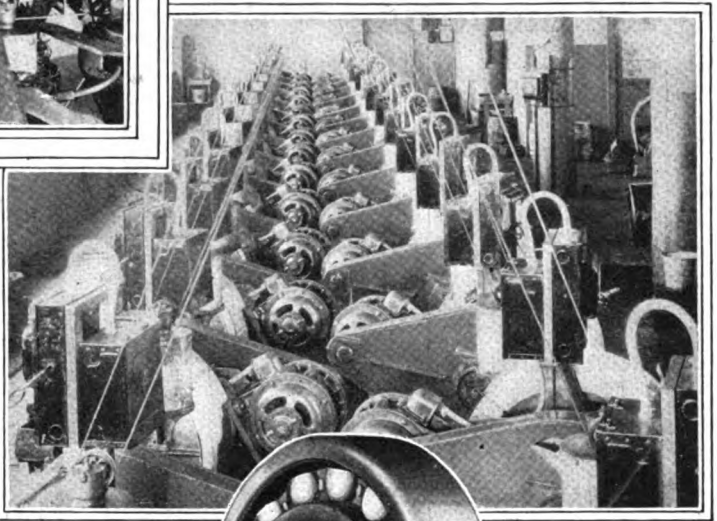
(Continued on page 38)

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Before

After



Cut Expense in Half and Add to Profits



THE GROWING tendency to displace unsightly, hazardous, power-wasting belts with individual drive electric motors has made the advantages of ball bearings increasingly significant.

Cleaner and more efficient motors are the rule where New Departures are used for they can be mounted with seals that keep lubricant *in* the bearings and *out* of the windings. Lubrication is positive and is also simplified for New Departures need be lubricated but once a year.

Mechanical or electrical injuries due to drop of rotor are eliminated because of the absence of wear in New Departure Ball Bearings and for the same reason, readjustments are never necessary.

Friction is brought to an absolute minimum by the pure rolling motion of New Departures. Productive time is increased since there are no interruptions because of bearing troubles.

The foregoing advantages represent a saving of at least one-half the usual maintenance expense.

Write for publications entitled "Cutting Your Costs" (non-technical), "Booklet K" (technical) and Engineering Data Bulletins on "Ball Bearing Application to Electric Motors." Any or all sent on request. Engineering representative will call for personal consultation if desired.

The New Departure Manufacturing Company

Chicago Bristol, Connecticut Detroit

New Departure Quality Ball Bearings

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for modern efficient machinery.

Your executives spend hours in careful consideration over its selection. Don't thoughtlessly limit its production by not using equal care in the selection of tools.

The economy of a production tool is fairly measured by the quality and quantity of the work it does.

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It will pay you to try them out



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Morse High Speed and Carbon Drills, Reamers, Taps and Dies sold by Progressive Distributors everywhere.

For pr... in this issue write Industry Illustrated

Muffling the Power Plant

(Continued from page 33)

The walls of the building are of brick 21 inches thick. Then comes a space into which is put sound-insulating material three-fourths of an inch thick, and outside of that a facing of hollow building tile. The ceiling is a concrete slab above which is three-fourths of an inch of insulating material and then another slab of concrete.

The doors resemble those of a refrigerator in that they are six inches thick, have beveled jambs and are felt-lined. Furthermore, they are held tightly closed with refrigerator door clamps.

The blind windows have lamps placed in a recess back of amber-colored glass so that at night the lighting effect is about the same as that from a window with a drawn shade.

When this station was put into operation it was several days before anyone knew that it was running, and then only from seeing the exterior lighting, and making inquiry.

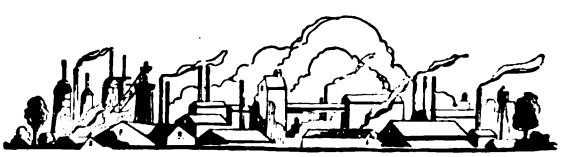
Central Stations in the South

(Continued from page 36)

future conditions should warrant it. Both stations are so situated that there is an ample supply of condensing water for the turbines; at Salisbury, N. C., the Yadkin River is utilized for this purpose, while at Lauderdale, Fla., a canal connecting the Everglades with the sea affords a practically unlimited quantity of water.

Near Salisbury, N. C., the Southern Power Co. recently built an auxiliary steam station equipped with two generators of 35,000 kw. at 90 per cent. power factor operating on 350 lb. steam pressure. There are four water-tube boilers each of 26,600 sq. ft. heating surface with superheaters furnishing steam at 700 deg. F. The furnaces are provided with fin-tube side and rear walls, air-cooled arch at the front and water-tube screen above the ash pit. A complete coal storage and preparation plant is installed and pulverized coal is used for fuel.

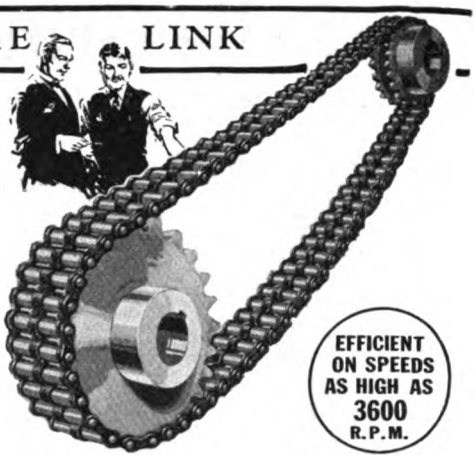
These two stations are typical of the power development that has taken place in the southern states during the past five years. Much is heard of the water power resources of that part of the country, but the experience gained in 1925, when there was no rainfall of any consequence over the south-eastern region for more than six months, showed the need of auxiliary stream stations to meet the increasing demands for electric energy in the southern industrial region.



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LOOK FOR THE DIAMOND ON THE LINK

Even the Well-Informed Engineer—



WE'VE got to forget a lot if we want to keep up-to-date. We can't afford to let ideas formed ten years ago blind our appreciation of a later—and, frequently, important—development.

For example—if we ever did think of roller chain as a typically slow-speed drive we've got to forget it. We've got to *kill* that association if we're going to make the most of modern Diamond Roller Chain adaptability, and high speed efficiency.

In these days of rapid engineering progress even the well-informed engineer frequently has to scrap a preconceived notion and concentrate on the modern facts.

Today, Diamond high speed Roller Chain will transmit power *at as high speeds as any other type of chain—quietly,* efficiently, smoothly.

In Diamond Roller Chain, improved steels, improved bearing surfaces, better sprocket tooth shapes, greater manufacturing precision have all been worked together into a design the very simplicity of which means added lightness and strength.

Thus it is that The Diamond Chain & Mfg. Co., with the largest plant in the world devoted solely to roller chain manufacture, has developed a chain of 98 to 99% efficiency—smooth, *quiet* and dependable, on speeds as high as 3600 r.p.m.

* * *

"But this can't be the roller chain we've always thought of as a low speed drive!" It most decidedly *isn't.* That's just the point—it's a chain unusually efficient on *high* speeds—unusually economical and dependable—a silent chain you ought to know more about! It is made in multiple strands as well as single.

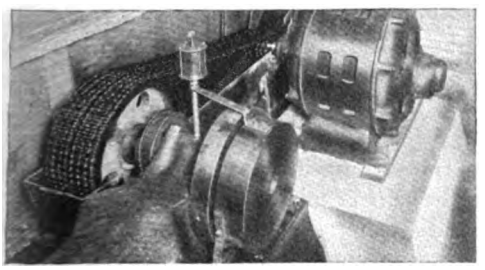
Rolling Surfaces ◇ *Discourage Wear*

DIAMOND CHAIN

ROLLING ~ AT POINTS OF CONTACT

How Vital is Economical Transmission to *Your* Profit?

TRADE MARK
Makers of High Grade Drive Chain Since 1890



A 60 h. p. blower drive using two strands of Diamond high speed triple Roller Chain—another example of the increasing use of this quiet, long lived, low maintenance transmission.

Production is your income—the efficiency of that production measures your profit. Production is dependent on *motion*—the motion of your machinery—machinery dependent for its motion upon motors. Diamond Roller Chain transmits 100% of the speed and 98-99% of the power developed in those motors. That is efficiency.

Investigate this modern Diamond Roller Chain now—*Tear out the reminder coupon.*



The Diamond Chain & Mfg. Co.
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You may send your booklet "Rolling the Problems Out of Transmission," to:

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LaSalle Grinders

For Precision and Production



No. 1 Plain and Surface Grinder

(Micrometer Adjustment)

Grinding wheels.....8"x1"
Between wheels.....15"
Height to spindle center..40"
Table surface.....8"x14"

Has vertical travel of 12" on guides ¾" by micrometer, and may be raised to within 2" of spindle center. Wheel grinds to center of a surface 9" wide.

Spindle speed.....2450 r.p.m
Countershaft speed.800 r.p.m.
Floor space.....18"x24"
Net weight.....300 lbs.
PRICE.....$115.00

La Salle No. 1 is equipped with every attachment to promote simplicity and speed in operation. The horizontal hand wheel carries a dial graduated to 1000ths of an inch, and as the divisions are 5/32nds of an inch apart, finer adjustments are easily obtainable. The knee may be brought to any position by means of the vertical hand wheel. Reamed bearings assure perfect alignment. Within its capacity no tool is more generally useful in tool room or shop. ***Its use insures precision.***

SHIPMENT FROM STOCK

ALSO MANUFACTURERS OF

No. 2 Automatic Surface Grinder No. 3 Surface Grinder
American Twist Drill Grinders

La Salle Grinders will satisfy your needs. Let us help you solve your grinding problems.

PRICES ON APPLICATION

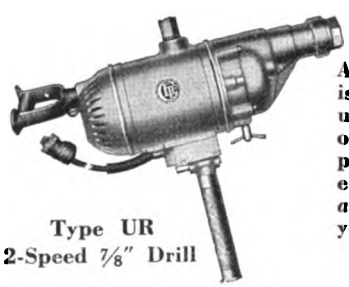
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The 2 Speed Drill



Type UR
2-Speed 7/8" Drill

A single speed drill is all right when used with twist drills of its maximum capacity—but for real efficiency on large *and* small twist drills you need

The Cincinnati
TWO SPEED DRILL

Either ½" or ⅞" capacities.

"The ALL-PURPOSE DRILL" is described fully in Bulletin No 122.

Ask for a copy today.

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"A Complete Line of Portable Electrical Every Purpose"

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Cylindrical Grinders

(Continued from page 15)

time previously taken. The finish and accuracy are most exacting on this job. The rolls are produced to within .0002" for concentricity, correct diameter, crown and parallelism of journals. This is a severe test of the quality of these grinders—and upon the performance of this machine a duplicate was ordered for a subsidiary plant immediately. It will pay you to investigate grinders of this class and take advantage of the many new production features which they contain. This is a severe test of the quality of these grinders and upon the performance of this machine two duplicate machines have been ordered for subsidiary plans. Turning now to Self-Contained Universal Grinders of the Tool Room type we find in Fig. 6 an interesting job of grinding a taperplug from high-grade tool steel. .025" stock is removed giving a very excellent finish. Taper must be within .0001", and the test is made by a light gauge. This is one of the great many jobs handled daily in the tool room of a large machine tool manufacturer. This is included in the series of illustrations to point out the accuracy which is demanded in modern manufacture, for accuracy must be obtained with low time. The machine is equipped with a tex rope drive, electric changes for work rotating speeds, sliding gears for table traverse and other productive features which are interpreted in dollars and cents for the user. Three individual motors are used for driving the work, the wheel head and the table feeds and pump. The machine is universal and entirely self-contained.

The same machine is shown in Fig. 7. This time grinding the outside diameter and one face of a thrust ring, of 1020 case hardened S.A.E. Steel. .015" stock is removed from the outside diameter and .005" from the face, giving a good finish. Limits of .0002" are maintained. Both headstock and wheel head swivel to grind the face of this thrust ring. After finishing the front face, the wheel head is quickly swiveled 90° and brought into the work to grind the sides of the ring. These grinders are flexible, can be changed quickly from one type of work to another without losing accurate adjustment or wasting time. For instance the change from live to dead spindle can be made in a few seconds by changing a nut and washer. Note particularly the tex rope drive for the grinding wheel, insuring a smooth, vibrationless and positive drive. No cone pulleys or shifting of belts of any kind. Thus you save high belt upkeep and loss of power.

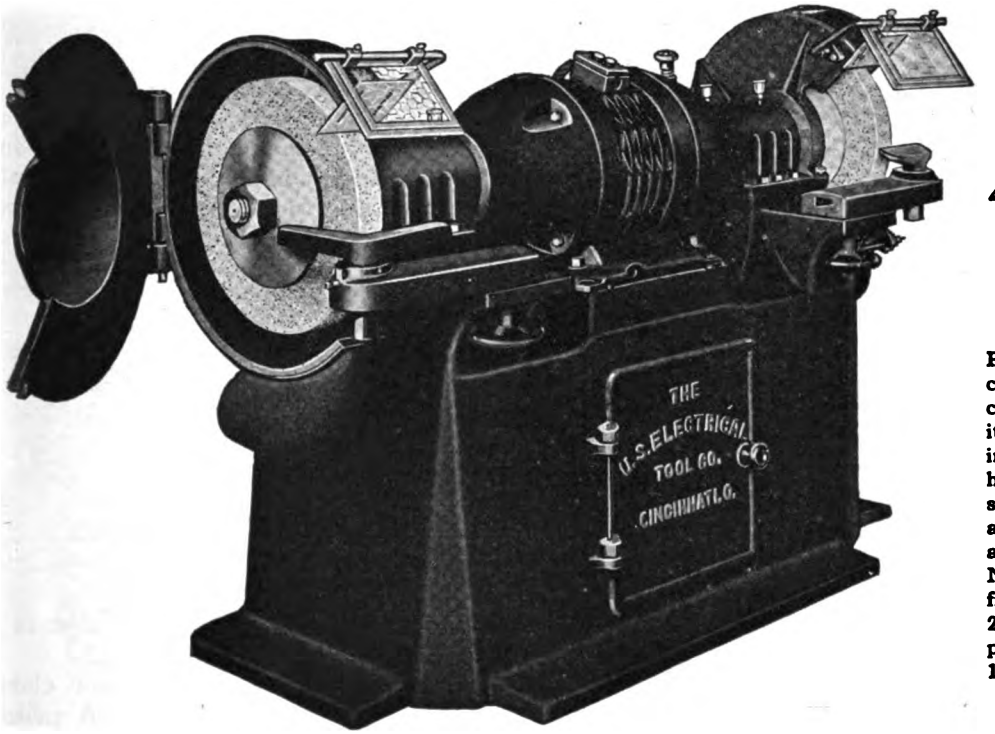
Production with accuracy is a requirement of modern machining methods. In each of the above cases accuracy has not been sacrificed to production. Furthermore savings have been made in lowered machining time, in the improved quality of the product, in a saving of floor space, a lowering of the inspection time in a number of other ways. These are added examples of the advisability of paying careful attention to existing methods of grinding in order to see if some improvement cannot be effected which in turn will increase production and also enlarge profits.

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CONVINCING records for long, steady, economical service have been made by U. S. Grinders throughout the world. And no wonder! They are designed and built to withstand continuous production under most severe conditions. Rugged construction eliminates vibration; only finest materials assure minimum wear.



U. S. Heavy Duty 4-Ball-Bearing Grinder

for A.C. or D.C.

Powerful motor is of 40 degree centigrade rating, with 100 per-cent momentary overload capacity. Four heavy SKF Ball Bearings (in dust-proof boxes) support heavy one-piece nickel steel spindle. Remote control in base assures motor protection under all conditions. Overload cut-out. No voltage release, etc. Six sizes from 18″ x 3″ to 30″ x 5″. For 220, 440, 550 volts two or three phase; 25, 40, 50, 60 cycles A.C.; 110, 220 volts, D.C.

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Silent Chain Drives

(Continued from page 28)

Silent chain drives are now generally used on lathes, shapers, planers, grinders, milling machines, slotters, gear hobbers, boring mills, drills, pipe threaders, and automatics.

On flywheel machines, silent chain drives have distinct advantages. The flywheel is really a power reservoir and the silent chain drive keeps the machine operating at full speed, transmitting power stored up by the flywheel so that there is no lag between operations, or slip just after an operation is completed.

Advantages similar to those enjoyed by the textile and metal working industries are obtained by the woodworking industry. These shops formerly presented a bewildering mass of belts, but the new era provides individual motor silent chain drives with the result that production is uniform, less room is required, and lower power costs result.

Whenever cleanliness is a requisite, such as in the mixing and grinding of food products, candy, cake, dough, cereals, etc., the silent chain drive has still another advantage—it preserves the wholesomeness of the product. Practically all food preparation machinery operated today is driven through silent chain drives. Still another condition which power transmission machinery must meet is that of excessive dust and grit incident to many types of manufacture. Again it is subjected to gases, fumes, moisture, acids and alkalis, and various degrees of erosion, corrosion, and process deterioration and silent chain drives are used extensively on all these different classes of equipment.

Purchase Control of Stores

(Continued from page 18)

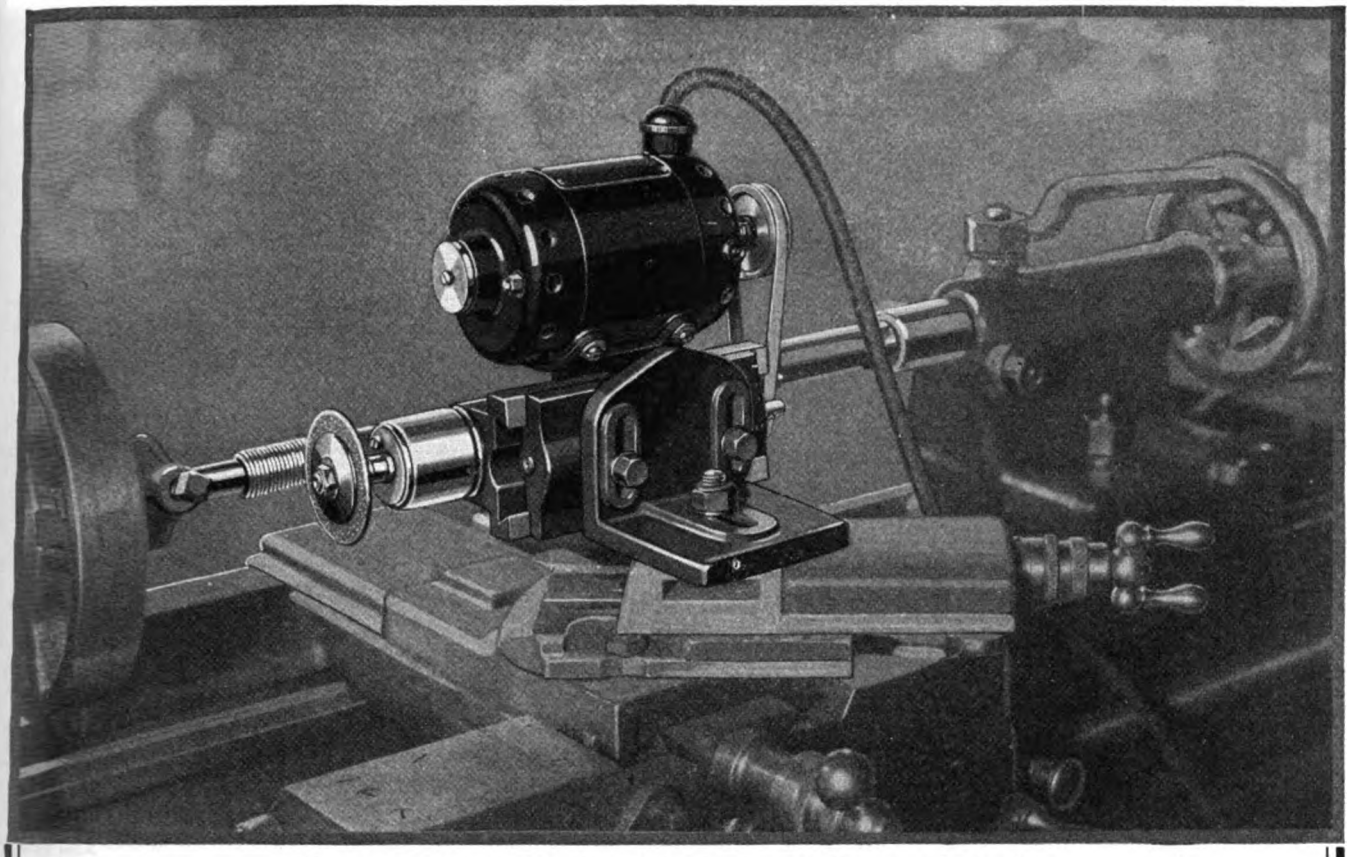
books should be on file both in the stores and in the purchasing department.

Classification and Symbolization. A proper classification of stores is of assistance in control. A primary classification might run raw materials, containers, supplies, and spares. Subsidiary classifications by groups would be made under these. For example, we could have under the supplies; Group 1—Pipe and Tubing, Group 2—Malleable Iron Pipe Fittings, etc., etc.

After stores have been classified, they can be symbolized, for which purpose both letters and numerals are used. A main symbol would represent the group, and following or subsidiary symbols the series and size or particular characteristics. The position of the letter or numeral should always be the same for the same classification. Also the same size or characteristic should always be represented by the same letter or numeral in the same position within the same group. In preparing symbolization charts, provision must be made

(Continued on page 44)

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No. 3 Dumore Grinder with angle plate, set up for thread grinding

Highly Adaptable

BOTH in production and toolroom work, the Dumore Grinder saves time and money. Quickly and easily applied to any machine tool, it enables you to handle external and internal grinding jobs to any required degree of precision.

A wide range of speeds from 3,600 to 50,000 R.P.M. provide the correct grinding speed for all wheels from the smallest size up to 5″ in diameter.

The savings possible when grinding is required, or can be handled, in the original setup are usually sufficient to repay the cost of the Dumore grinder the first year. And there are many jobs you can handle more profitably when this grinder is part of your equipment.



This book, published in the interests of greater precision, contains an interesting study of tolerances. Every man interested in precision work, the use of gages and the securing of proper fits, will find the book valuable for reference purposes. It is free.

Use the coupon.

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Wisconsin Electric Company, 70 16th St., Racine, Wis.
Please send me Free, your latest grinder booklet "1/10,000 of an Inch" and tell me what allowance you will make on the Grinder I have now. This grinder is—

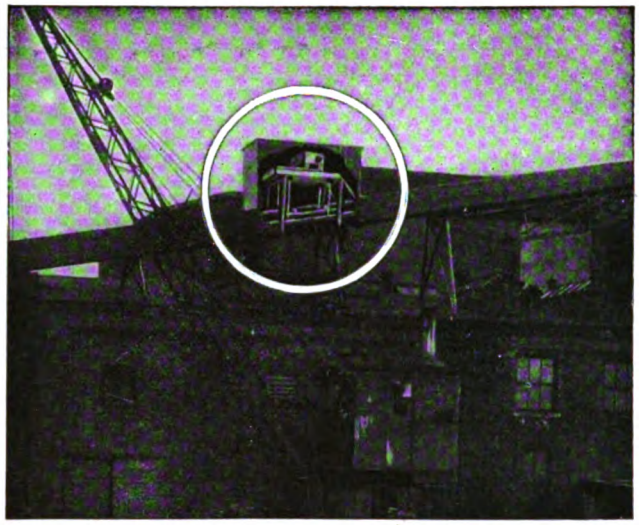
.....
(Insert make and model of Grinder you have on this line)

Name .....

Address .....

City ..... *State* .....

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Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.

Parks shipping room saw *at a lower price!*

was $75.00

NOW $60.00

without motor



Cut your crating payroll and speed up your shipping room with this Parks "Dixie," the ideal crating saw.

Big Work; little price—that's the "Dixie" shipping saw. Fast, Durable. Guaranteed for 10 years.

Your present crating costs will show you need this saw. It will do more work than an extra man and pay its small first cost in a few weeks.

Send the coupon—Today; for circular!

The Parks Woodworking Machine Co.,
1600 Knowlton St.,
Cincinnati, Ohio

Canadian Factory
208 Notre Dame East, Montreal, Canada.

PARKS
WOODWORKING MACHINES

FILL OUT AND MAIL THIS COUPON—NOW!

I.I.

The Parks Wood-Working Machine Co., 1600 Knowlton Street Cincinnati, Ohio.

You may send me descriptive circular on the Parks "Dixie" crating saw. We now employ .....men making crates.

Name .....
Firm Name .....
Addresses .....
City ..... *State* .....

(Continued from page 42)

to allow for insertion of later additions to the stores. In our article on The Mechanism of Purchasing, we suggested a system of requisitioning on the purchasing department by symbols for specifications, reference being made to the Stores Specifications Book for the detail specification. By proper symbolization, this method can be so simplified the buyer by memorizing certain keys can read many of the articles direct from its symbol without reference to either the Stores Specifications Book or the Symbolization Chart. Fig. 1 is a sheet from a loose-leaf-visible Stores Specifications Book so prepared. 76-83380 would be read "Packing-Garlock—No. 150—Size ½," and written in this way or in the reverse order by the order-typist in writing up the order. Numerical symbols only were used in preparing this symbolization to facilitate use in tabulating machines. Each group, of course, comprises many more series than the two shown.

Quantity and Time. Determination of the quantity to carry, when to order, and quantity to order involves consideration of the rate of consumption, rate of delivery, time required to procure, local or factory purchase and if factory how long required to produce, storage space available, turnover desired, and advisable factor of safety. Requisitions should state delivery desired. Minimum and maximum limits, and size of purchase units should be established. Larger purchases should be made only when conditions unquestionably justify them. The inventory also should be carefully balanced with regard to completeness of assortment of parts, sizes, or kinds.

Inventory Investment and Turnover. The stock should be kept as active as possible to the end that the minimum capital will be required for operations, inventory investment decreased, and turnover increased. Unnecessarily large, and slow moving inventories tie-up capital, entail high interest charges on borrowed capital or loss of interest on invested capital, involve greater deterioration and obsolescence, excessive storage space, large insurance premiums, and heavy losses in case of fire. Also, they result in losses in falling markets. As for advancing markets, contracts over a period with requisitions and deliveries as required are much to be preferred where they can be arranged.

Detail Stock-Record Forms

The immediate control of stock quantities is obtained by means of the detail stock-records, to which we have already referred. We shall examine a few of the possible forms for use with the different methods. They will be self-explanatory in the main. Where there is a question, we will explain.

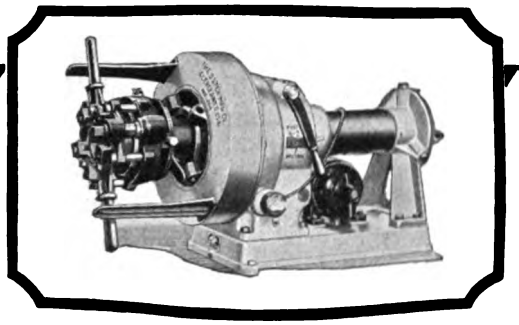
In Fig. 2 is shown a stores record sheet for use with accounting or bookkeeping machines. All work on this sheet is done by machines.

In Fig. 3 is shown a two-card record for use in visible-card-record cabinets. The Master Card gives a permanent purchase, cost, consumption, and turnover record. The Auxiliary Card gives a running [illegible] of receipts and disbursements. The [illegible] dered, shipped, long" are for [illegible] of different colors to flag inf[illegible]

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For products not advertised in this issue write Industry Illustra[illegible]

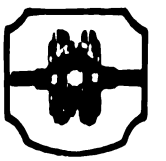
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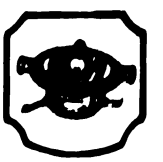
No. 414 Power Boy
Threads pipe from ½" to 4" through the barrel—from 4½" to 12" with auxiliary drive shaft.

UNPARALLELED progress has been made by Oster in the past three years in the discovery and development of entirely new and exceptionally economical methods and equipment for threading and cutting pipe. Pipe-threaders who have kept in touch with Oster during this time are threading pipe today at a low cost not dreamed of three years ago.

ANY new pipe installation job or pipe repairing job can be done with less labor, in less time and at less cost with an Oster—the most complete line of pipe-threading equipment in the world. There's an Oster tool for every job no matter how small or large. The Oster catalog will *prove* how you can save money on pipe-threading. Bulletin No. 72 describes the new No. 414 Power Boy—the first really portable, heavy duty pipe-threading machine and the greatest money saver for industrial pipe repair and installation jobs ever produced. Send for the catalog and bulletin today.



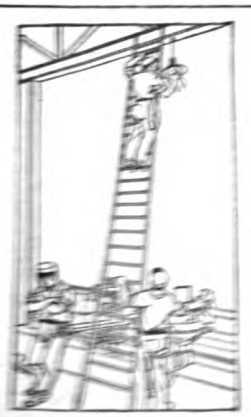
Bull Pipe Die Stocks
For pipe from ½ to 2 inch



Receding Die Stocks
For 1" to 4" pipe

THE OSTER MANUFACTURING CO.
Manufacturers of the Most Complete Line of Pipe Threading Equipment in the World
2058 East 61st Place · · Cleveland, Ohio

OSTER





"Why up in the Air"—

—When reflectors can be cleaned more frequently, safely and thoroughly down on the ground?

They are worthless unless kept in a reflecting condition. Dirty reflectors do not reflect.
Why install a lamp where it cannot be cleaned at all —or only by the climbing process?
The THOMPSON Safety Lowering Switch or Disconnecting Hanger enables overhead lamps to be lowered away from the electric circuit for cleaning the reflectors or renewing bulbs. The advantage is obvious. The Hanger is inexpensive and easily included in present installations. For outdoor and indoor use.

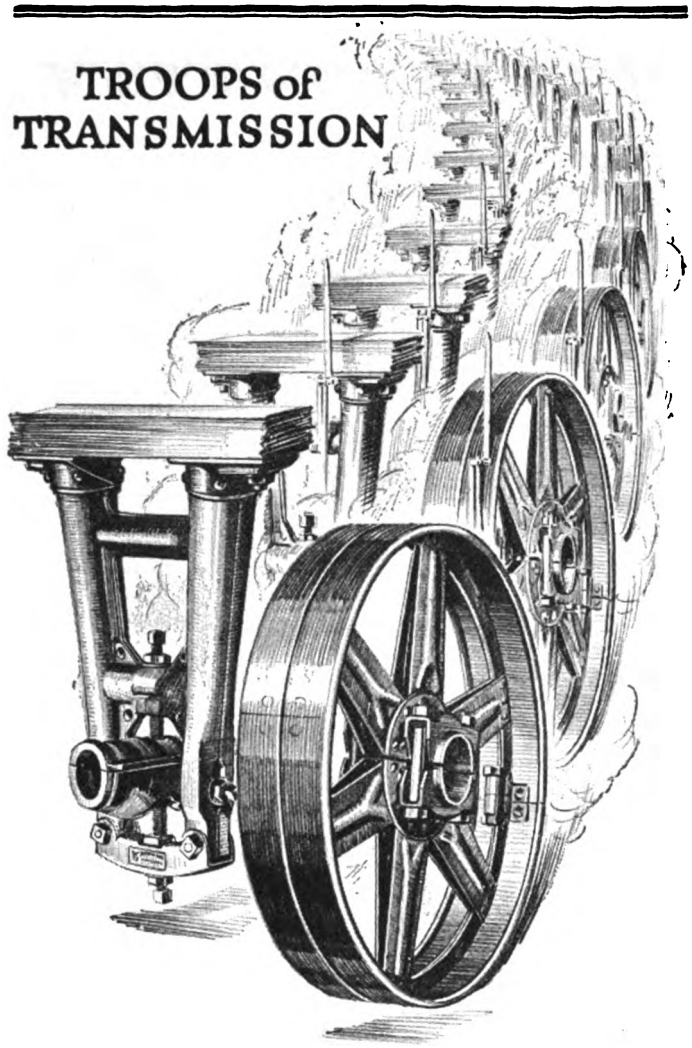
Illustrated booklet and complete information on request.

THE THOMPSON ELECTRIC COMPANY
38 West Ninth St., CLEVELAND, OHIO, U. S. A.

THOMPSON
SAFETY LOWERING SWITCH
or HANGER

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AS TROOPS in action, overcoming resistance, carry objective after objective, so do pulleys and hangers, belts and shaft, bearings and couplings, transmit power from engine to main line, through department after department on down to the final objective—the machines that complete the last steps of production.

In power transmission there is resistance at every point, a resistance, however, that can be lessened to a noteworthy degree by using the right kind of pulleys and the right kind of hangers.

—pulleys that are light without sacrifice of strength, that are designed to grip the belt snugly and tight, that offer every practical advantage that has thus far been developed in the best of belt pulley design.

—hangers that are strong and rigid against vibration, made of tough steel which will not break, easy to adjust and that are everlastingly dependable and at the same time trim, neat, smooth in line and stalwart in appearance.

This description accurately fits American Steel Split Pulleys and American Pressed Steel Shaft Hangers.

Your request for more information will be answered promptly.

THE AMERICAN PULLEY CO.

PRESSED STEEL:

PULLEYS HANGERS HAND TRUCKS
MISCELLANEOUS STAMPINGS

4200 Wissahickon Ave. Philadelphia, Pa.

The names and addresses of "American" dealers are listed in MacRae's Blue Book.

AMERICAN
PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS
PATENTED

(Continued from page 44)

details on the card. Turnover in conjunction with Monthly Consumption, Minimum and Maximum, and the signals operates to control activities. Minimum and Maximum may be either in quantities or period.

In Fig. 4 is given a single-sheet record for use in loose-leaf visible binders. Steel or celluloid signals of different colors may be clipped on the bottom of this sheet for flagging.

FIG. 5 shows a two-sheet record for use in loose-leaf visible binders. The Master Sheet gives a permanent reference record, the Auxiliary Sheet a running control over disbursements. Lots are brought down one at a time from the Master Sheet to the Auxiliary Sheet, and disbursed until consumed. To eliminate the metal or celluloid signals for flagging, which interfere more or less with writing when there are many in a binder, provision is made in the lower left-hand corner of the Master Sheet for a different method of flagging. By means of pencils of different colors, much information can be flagged in the space provided, and if the marking is made simply as a light check, it can be easily erased without injury to the sheet when the situation has changed.

These few forms, of course, do not even begin to exhaust the possibilities. They are given as suggestive rather than final. The needs of the particular case will dictate the character and details of the form to be used.

Six Power Saving Points

(Continued from page 21)

tional to the load on the hangers. The most heavily loaded hangers in any group are at the main drive pulley and at the cross belt pulleys if any. These pulleys and belts are the largest and highest speed in the drive. In addition to the additional friction which they introduce they cause a surprisingly large part of the pulley and belting windage losses of the group as the above tabulation indicates. When the exigencies of manufacturing force such a layout of overhead transmission as shown in Figure No. 4 it is often advisable to break the drive up into two groups unless the load of the individual machines is exceedingly variable.

	Figure No. 3		Figure No. 4	
Average load on group horsepower	35	35	35	35
Friction lineshaft hangers, (babbitt bearings)	0.6		0.8	
Friction lineshaft hangers, (ball bearings)		0.17		0.27
Friction countershaft, (babbitt bearings)	1.2	1.2	1.2	1.2
Pulley windage	0.24	0.24	.80	.80
Belting windage	0.75	0.75	1.61	1.61
Miscellaneous and unaccounted for	.84	.84	.84	.84
Total losses at no load	3.63	3.2	5.25	4.72

Where line shafting can be conveniently located so that the countershaft belts pull both ways as shown in Figure No. 3 it is worth while. This greatly reduces the loads on the lineshaft bearings and makes a corresponding saving in friction losses. This saving is not large enough to justify any considerable sacrifice in

(Continued on page 48)

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Insures Correct Alignment

of motor and reducer shaft

In one of the newest and most modern plants, where high production must be maintained, Jones Speed Reducers have been selected. Past performance records in other plants of this company made this a natural selection.

The view shown below illustrates an elevator drive from coal hopper to bins in a coal grinding building. Note in particular that the motor and reducer are mounted on the same cast iron base. Correct, definite alignment is assured between the motor shaft and high speed reducer shaft. There is no chance for misalignment. This assembly is recommended because it is the most convenient, the most serviceable and the most substantial.

All Jones Speed Reducers are as mechanically perfect as it is possible to make them. Their operating economy is proved over a period of many years' service. They are adopted as standard equipment by many leading manufacturers of mechanical drives. They are specified by many prominent engineers and designers.

Once installed they can almost be forgotten except for occasional replenishing of the oil supply in which the gears operate inside the dust-proof housing. Perfect lubrication, so necessary to machinery, is assured.

If you are interested in the application of enclosed speed reducers to your production problems, write us for catalogue Number 26.

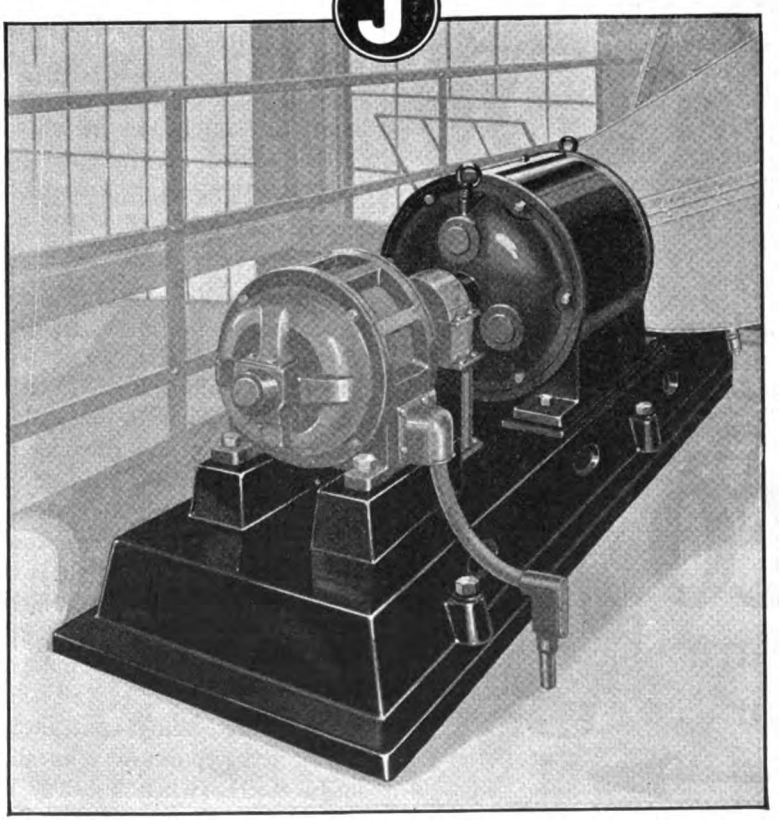
Jones Speed Reducers

W. A. JONES FOUNDRY & MACHINE COMPANY

Main Offices and Works..... 4412 *W. Roosevelt Rd., Chicago*

Branch Sales & Engineering Offices

New York
Cleveland
Milwaukee
Pittsburgh
Buffalo
Detroit



Branch Sales & Engineering Offices

Birmingham
St. Louis
Cincinnati
Peoria
San Francisco
Los Angeles

Visit Booth 464

New York Power Show

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It would have Earned $961.25



They called old Jameson the "temperature wizard." He had an uncanny knack of judging temperature—a vitally important thing in the manufacture of "Gem" Products, where a few degrees one way or the other ruined the batch.

When the "Gem" Engineers talked automatic temperature control for safety, the owner laughed. "Isn't old Jameson good enough?" he challenged. "He hasn't missed yet."

Then one day an important order had to be rushed to catch a certain sailing for London. Jameson was at home nursing an attack of the grippe. Somebody else guessed the temperature and the batch was spoiled. The order was not filled and a big, new customer was lost, together with a profit of $961.25.

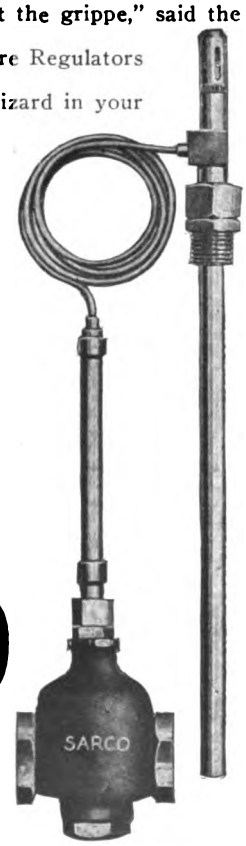
At the conference next day, the Chief Engineer again recommended installing Sarco Temperature Regulators.

"A Sarco Temperature Regulator works 24 hours a day; it's a Jameson that can't get the grippe," said the Engineer.

And this time Sarco Temperature Regulators were installed.

You may have a temperature wizard in your plant—but he's human. A Sarco is more dependable. It responds instantly to the slightest temperature change. Automatically admits or shuts off steam, preventing temperature variations. Once set for a given temperature, it always maintains that temperature.

Because of its simplicity, the Sarco costs less than other regulators and is easier to install.



Send for our Booklet R-98.

SARCO CO., Inc.

183 Madison Avenue, New York

Boston Chicago Detroit
Buffalo Cleveland Philadelphia
Adolf Frese Corp., Los Angeles
Peacock Bros., Ltd., Montreal

SARCO

Temperature Regulator

(Continued from page 46)

other directions, namely, crossed belts to countershafts on one side of the line or top pull belts on a number of severe drives.

Lineshaft Speeds. The selection of lineshaft speeds cannot be made entirely on a basis of engineering advantages or economic principles. If the matter were entirely a matter of choice with the designer, considerable first cost would be saved at no great increase in friction losses by using higher lineshaft speeds with higher belt speeds, narrower and thinner belts, smaller hangers and shafting and ball or roller bearings. Such a development seems to be slowly taking place with the more and more general use of ball and roller bearing hangers. The principal difficulty is the sizes of driven pulleys on machines and special machine countershafts which must ordinarily be purchased with the machines when time is an object. These pulley sizes are proportioned for the lineshaft speeds most commonly used in the past. Slight increases are possible to the designer but any radical change from present customary speeds will be a gradual development.

For machine shops a lineshaft speed of 200 r. p. m. will generally be found a fair compromise. For woodworking which involves higher speed machinery, 300 r. p. m. is a fair average. For grinding departments 400 r. p. m. is frequently used. There are occasional applications where higher speeds are entirely practical and even more convenient. Of late years we find in such applications an occasional iconoclast experimenting with a 600 r. p. m. motor direct connected to a lineshaft having ball bearing hangers. A very high grade flexible coupling is necessary. This practice seems fundamentally sound.

Hangers and Bearings. So called anti-friction bearings pay. They save some power. What amounts to a greater saving in most applications; they almost entirely eliminate oiling labor, emptying catch pans and material spoiled by dripping oil. In this latter respect ball bearings and spiral rollers are about on a par. Other characteristics determine the choice between them for any given application.

Speed. The maximum speed for spiral roller bearing lineshaft hangers is 400 r. p. m. Even at this speed the larger sizes run rather warm for grease lubrication.

Split Bearings. Ball bearings cannot be split. Satisfactory split spiral roller bearings with spirally split races are available. In a department where machines are very seldom moved, ball bearing hangers would ordinarily be chosen, particularly if the lineshaft speeds are high. It would then be necessary to take down a whole length of shafting and remove pulleys and couplings whenever a hanger bearing is to be added. There would thus be realized the lowest possible hanger bearing friction. Removing shaft couplings, it may be noted, is a less serious matter of late years due to the general use of compression type couplings. In a room where machinery is frequently moved and where the lineshaft speed is moderate, spiral rollers would be considered first, because being split they can be installed or removed at any point on a lineshaft without disturbing the shaft. Often when a heavy machine is added, a new

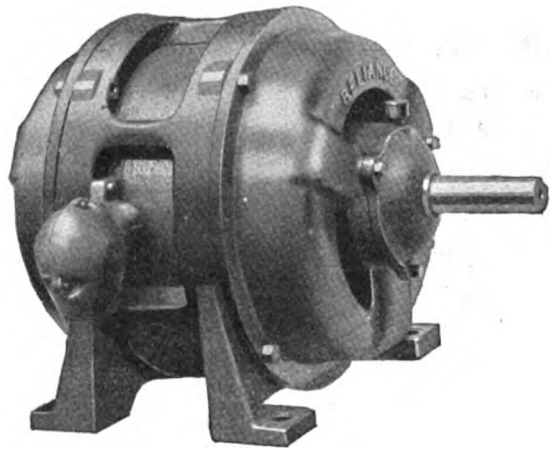
(Continued on page 50)

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money saving directions

"lubricate once a year"



Can you think of any easier way to make that motor-maintenance curve take a dip than to cut down lubrication to once in 12 months? You can start doing this at once by putting Reliance Ball-bearing Motors to work in your plant. You will soon discover that other advantages are lowering your upkeep charges and cutting down interruptions.

A good way is to try it out on some job where you think it can't be done.

Interesting information regarding anti-friction bearing motors is given in our illustrated Bulletin 400

RELIANCE ELECTRIC & ENGINEERING CO.
1048 Ivanhoe Road, Cleveland, Ohio

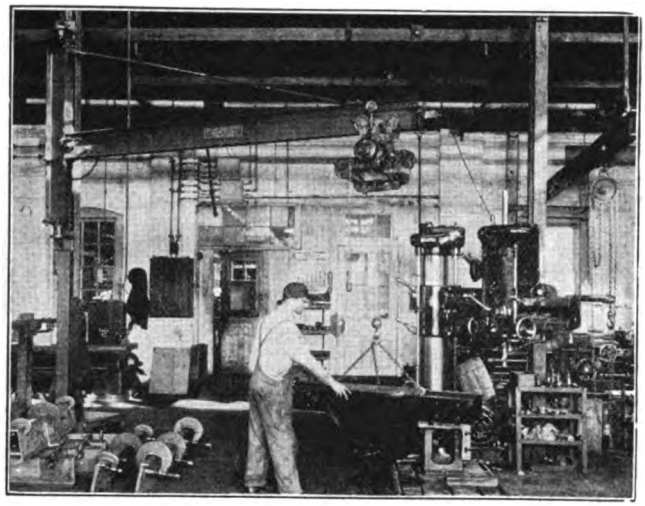
Branches:

Boston, New York, Philadelphia, Pittsburgh
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RELIANCE A-C D-C MOTORS

with Ball Bearings

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MULTIPLY MAN-POWER
WITH
ROEPER ELECTRIC HOISTS

Keep the machines active so they produce the utmost.

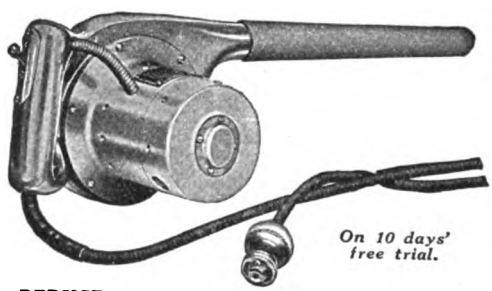
The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

Ask for full information.

Roeper Crane & Hoist Works, Inc.
1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys

Ball Bearing Portable Blower



On 10 days' free trial.

6½-lb. Air Cooled Ball Bearing Motor $45.00 Net

REDUCE your FIRE HAZARD and MOTOR TROUBLES by the frequent use of this "MARVEL" Portable Dust Blower, which gives a continuous blast of DRY air, for blowing inflammable dust our of your MOTORS and other machinery.

Ask us to ship you one on 10 DAYS TRIAL.

This tool is in daily use in several thousand industrial plants and saves its cost every year, several times. Has 20 feet high grade cable and armored plug. Perfectly balanced. Has TOGGLE SWITCH in handle, operated by thumb. Gives 16-in. water column pressure.

Note the Metal Conduit carrying wires from motor to handle.

Motor operates at 10,000-R.P.M. on "NORMA" BALL BEARINGS. This blower is a great time and labor saver, and its mechanical and electrical design gives assurance of a very long life, with a minimum of attention.

Made with UNIVERSAL motors (A.C. & D.C.) for both 110 volts and 220 volts. SHIPPING WEIGHT 18 lbs. Shipped on 10 days' trial, ANYWHERE.

A complete Set of VACUUM CLEANER ATTACHMENTS for $10.00 additional.



Manufactured by

ELECTRIC BLOWER COMPANY
352 Atlantic Avenue
Boston 9, Mass., U. S. A.

(Continued from page 48)

hanger is necessary close to the new lineshaft pulley. In such cases a split bearing is a real boon.

Friction Losses. As an average, at the moderate loads and at the temperatures under which most lineshaft hanger bearings run, the friction losses in the spiral roller bearing amount to 75% of those in the best ring oiled sleeve bearings, while the friction losses in ball bearings amount to only 20% of the best sleeve bearings. It is thus evident that there is a distinct advantage in the ball bearings from a friction standpoint wherever the split feature is of no particular use.

Broadly then, ball bearing hangers are generally advisable in the heavily loaded hangers at the motor drive and at cross belts on all drives, they are generally preferable for all lineshafts operating at 300 r. p. m. and above if machinery is seldom moved, or if all machines are light so that hanger changes are very infrequent. For all really high speed shafting, say above 400 r. p. m., sleeve bearings are troublesome, spiral rollers are unsuitable, so the only choice is between balls and taper rollers. For moderately loaded shafting, at speeds below 300 r. p. m., the advantage of split bearings recommends spiral rollers wherever machinery moves requiring hanger changes are to be expected even infrequently.

Motor Drive. In general it is best to install one length of larger shafting at the motor drive pulley. This pulley should be close to a hanger. Where the motor is large a hanger each side of the motor drive pulley is often advisable. Wherever possible, motors of fifteen to fifty horsepower should be twelve to sixteen feet from the shaft, of course farther is better. When drives approach these lower limits it becomes increasingly important that the pull be on the lower strand of the belt (bottom pull belt).

As a purely engineering proposition motors should always be of as high speed as will allow reasonable motor pulley diameters. The higher the motor speeds the better the power factor and efficiency, the lower the cost, the less room required by the motor and the lighter and more easily handled is the motor if quick replacement is necessary in case of a breakdown.

On the other hand the advantage of keeping all possible motors of a given horsepower in any one plant, identical and interchangeable so that only one spare is necessary for each horsepower, is even more compelling than the engineering arguments. Thus in the average plant with many lineshafts operated at about 200 r. p. m., this lineshaft speed determines the best standard motor speed for each horsepower about as follows:

1 to 3 Hp.	Speed 1200 r. p. m.
5 to 50 Hp.	Speed 900 r. p. m.
75 Hp.	Speed 600 r. p. m.
100 Hp.	Speed 600 r. p. m.

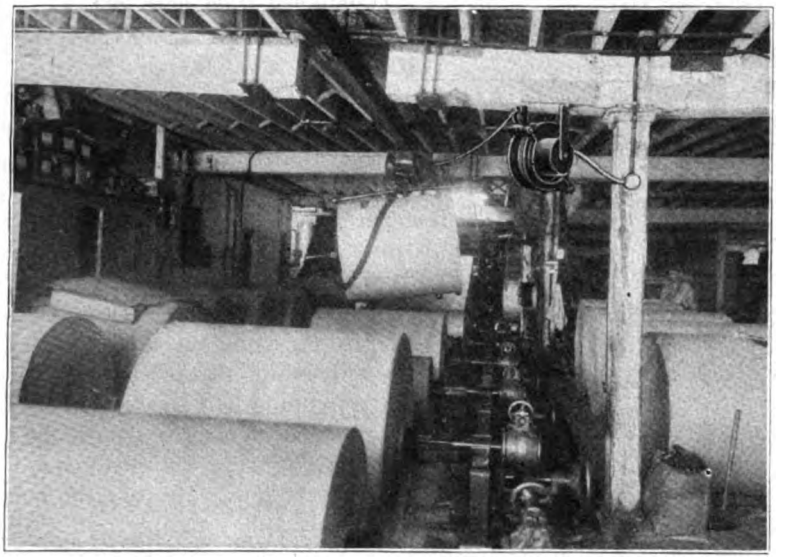
In a wood-working shop where almost all group shafts run at 300 r. p. m. it would be preferable to use higher standard speeds and jack the one or two motors required to drive the repair machine shop and any other 200 r. p. m. groups. The preferable standard would then be:

1 to 3 Hp.	Speed 1800 r. p. m.
5 to 30 Hp.	" 1200 r. p. m.

(Continued on page 52)

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Constant Duty Reelite with Swivel Cable Outlet as used in connection with monorail hoist at Plastergon Wall Board Company, Buffalo, N. Y.

No power-cable to tend, yet almost no cable wear

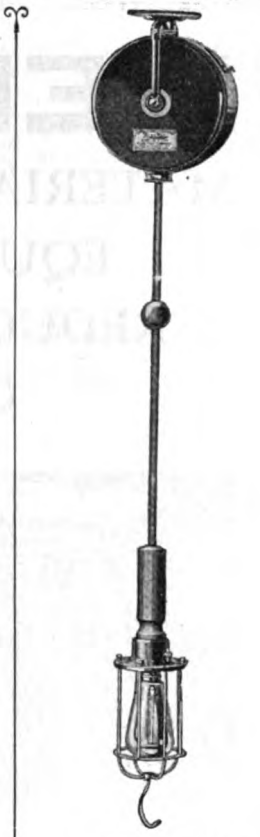
Wherever electric current must be fed to non-stationary machines (mono-rail or portable hoists, lifting magnets, traveling cranes or mobile-transfer cars) a Reelite should be installed—merely on the basis of *economy* to say nothing of the increased efficiency it assures.

Automatically, it reels the cable in, pays it out, keeps it clean, unkinked, uncut, never allowing a slack foot yet exerting no undue tension.

It's an absolutely mechanical cable-tender and does its job far better than a man.

Expensive cable lasts four or five times as long when Reelite cares for it and consequently it is just that much less often that machinery has to stand idle during cable-repairs.

Get a Reelite for every electrically-operated portable machine. Reelite pays for itself over and over again. There's a size and type at a reasonable price no matter what the job. Send the coupon, without obligation, for latest catalog.



Reelite

REG. U. S. PAT. OFF.

The handy light on a reel

For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connector in place of light so that it will furnish current for small machinery, and portable drills, etc.



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1716 *Wellington Avenue, Chicago, U. S. A.*
New York—150 Varick St. Los Angeles—340 Azusa St.

CONSTANT DUTY
Reelite
REG. U. S. PAT. OFF.
Carries Current Where Needed

APPLETON ELECTRIC CO.
1716 Wellington Ave., Chicago

Gentlemen:

Please send us a copy of your new Bulletin 501-S, together with prices.

*Name*_____

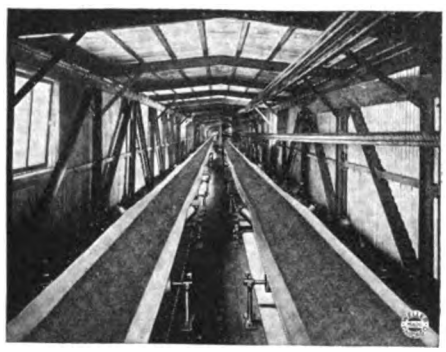
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WELLER BELT CONVEYORS for Carrying the raw materials saves man power



BARREL ELEVATOR WELLER also builds Bucket and Package Elevators

Weller machinery is built to give the maximum of service at the lowest possible price for upkeep and if you contemplate the installation of new equipment or the replacing of old —investigate the design and quality of the machinery we make.

SUBMIT YOUR PROBLEM



WELLER SPIRAL CONVEYOR

Cold Rolled Steel Sectional Flights. Evenly Balanced, Run True, Wear Long.

WELLER MFG. CO.

1820-1856 N. Kostner Ave.

Chi[illegible]

(Continued from page 50)

35 to 75 Hp. " 900 r. p. m.
100 Hp. 900 or 720 r.p.m.

It is seldom advisable to use motor pulleys of standard diameter. The manufacturer's standard pulley for each frame is proportioned in small and medium sized frames, to keep within a reasonable belt speed, say below 5,000 feet per minute, for motors of 1800 r. p. m. speed in that frame. For motors of all lower speeds than 1200 the standard pulley gives a lower belt speed than is desirable. The best way to decide on the motor pulley diameter is to figure on using the largest pulley on the lineshaft which will avoid interference at the ceiling, provided the corresponding belt speed is not over 4,000 feet per minute, and then figure the size of the required pulley on the motor, figuring full load speed of the motor from the motor name plate, not the nominal or no load speed. If this pulley figures out smaller than the manufacturer's standard pulley, we need longer lineshaft hangers or a slower speed motor. If the pulley is but a little smaller than standard it is generally permissible to use this diameter with a belt wider than standard if the motor can be set a generous distance from the lineshaft. As a last precaution check up to see if the lineshaft pulley will reach down dangerously close to the head of a tall man standing on the floor.

Illumination and Color Matching

(Continued from page 24)

overcast skies. Such test has been made by the Laboratory for Lighting Technique at the Berlin Institute of Technology, and the curve as shown on Fig. 5, indicates a remarkably close imitation of natural light.

It is claimed that by measuring the color temperatures with the rotary dispersion colorimetric photometer at the distance of 90 c. m. from the diffusing MgO surface a value of 4575° K was obtained with a frosted vask, and when screened with a special blue disk, a value of 7200° K was recorded.

Thus the nearest approximation to the quality of sunlight and diffused daylight it attained and the accuracy of color-matching with such a source of artificial light is practically as accurate as may be made under the natural light.

These sunlike lamps, as now distributed by an American company, have gained recognition and approval from the leading American industries.

From the practical point of view, it is important to notice that while these lamps are of enclosed type, with metal reflectors, they give ample and even illumination not only on the floor, but also on the ceiling and the shadows are soft and unobjectionable, as may be seen on the photograph of actual installation, Fig. 6.

Fig. 7 illustrates an installation of this method of illumination at the R. H. Macy Department Store, where the goods are received and carefully inspected as to colors, shades, and all possible defects.

Fig. 8 illustrates installation at the Amalgamated Silk [illegible]poration Testing Department, where the inspectors [illegible]d on uniformity of the light from the sunlike unit, [illegible] well established fact that the spectral value

(Continued on page 54)

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TWENTY YEARS *without a Drink*

THE amazing thing about this oilless feature of Arguto Bushings and Bearings is that it's true! Absolutely! Many are the testimonial letters and statements we receive saying that over even such a long period of service as twenty years, that NOT ONE DROP OF OIL has been applied to Arguto Bearings.

Specify Arguto—with a life five to six times AT LEAST that of bronze or babbitt metal—and have by far the cheapest bearings per year.

There's an Arguto to fit every need and that need exists wherever long wear, low repairs, cleanliness, reduced fire risks and the prevention of life hazards are desirable assets in operation.

If you are interested in these and additional advantages, write us now for fuller details.

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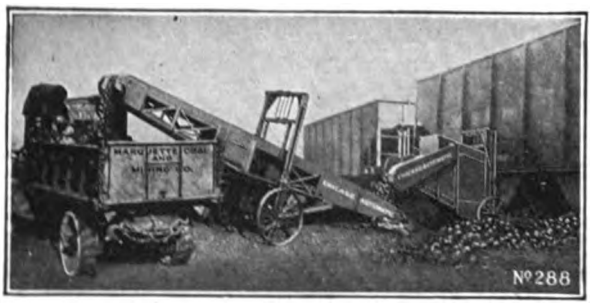
Wayne Junction , Philadelphia, Pa.



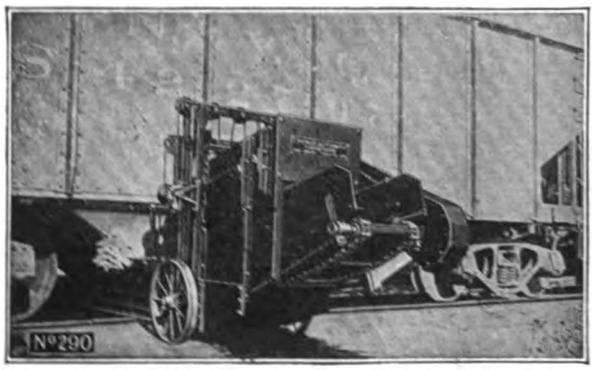
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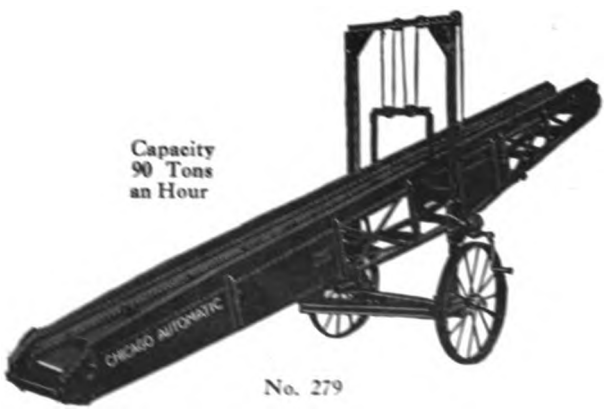
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Chicago Automatic Model T. U. Track Unloader and Model O. T. W. Conveyor in use
90 tons an hour is the capacity of both machines



The Model T. U. goes under any car and handles all classes of fuel



This Model O. T. W. 90 Conveyor receives the fuel from the T. U. for delivery into bin or storage

Write for complete information

Chicago Automatic Conveyer Co.

Originators of the portable conveyor
1847 South 55th Ave., Chicago, Ill.
(Suburb of Chicago)

Representatives desired for several

(Continued from page 52)

of daylight continually changes during the day from hour to hour, as well as from season to season, not to say anything of the influence of clouds at times reflecting and at times obscuring the sunlight.

The same figure represents a typical installation in a printing ship. In this industry the correct quality of light and proper amount of it are particularly important, especially when color work is done. But perhaps the most exacting requirements for correct reproduction of daylight from artificial source could be expected in the chemical industry, and in manufacturing of paints and varnishes.

Fig. 9, loaned by the courtesy of Valentine & Co., shows a Nitro-Valspar jewel color exhibition, where the jewels loaned by the American Museum of Natural History are compared in color with the product of Valentine & Co.

Steel Shelving

(Continued from page 31)

There is another argument in its favor—fire resistance. Here its worth is two-fold. In the first place, the steel shelf protects its contents and prevents its adding to the flames. Instances frequently occur where fires starting in one section smolder and die without spreading to adjoining bins. In fact, weeks and months often pass before it is discovered that there has been a fire. Secondly, and this phase is equally important, the steel shelves offer protection in that they do not add to combustion. Steel cannot burn and flames find it hard to make headway amidst steel equipment. The experiences of many manufacturers bear this out.

Insurance companies in many states make a varying rate distinction between wood and steel shelving because the latter type is universally recognized as the better risk from every angle. Especially where the shelving is exposed or where it must carry combustible material is the rate affected.

A Time Saving Experience

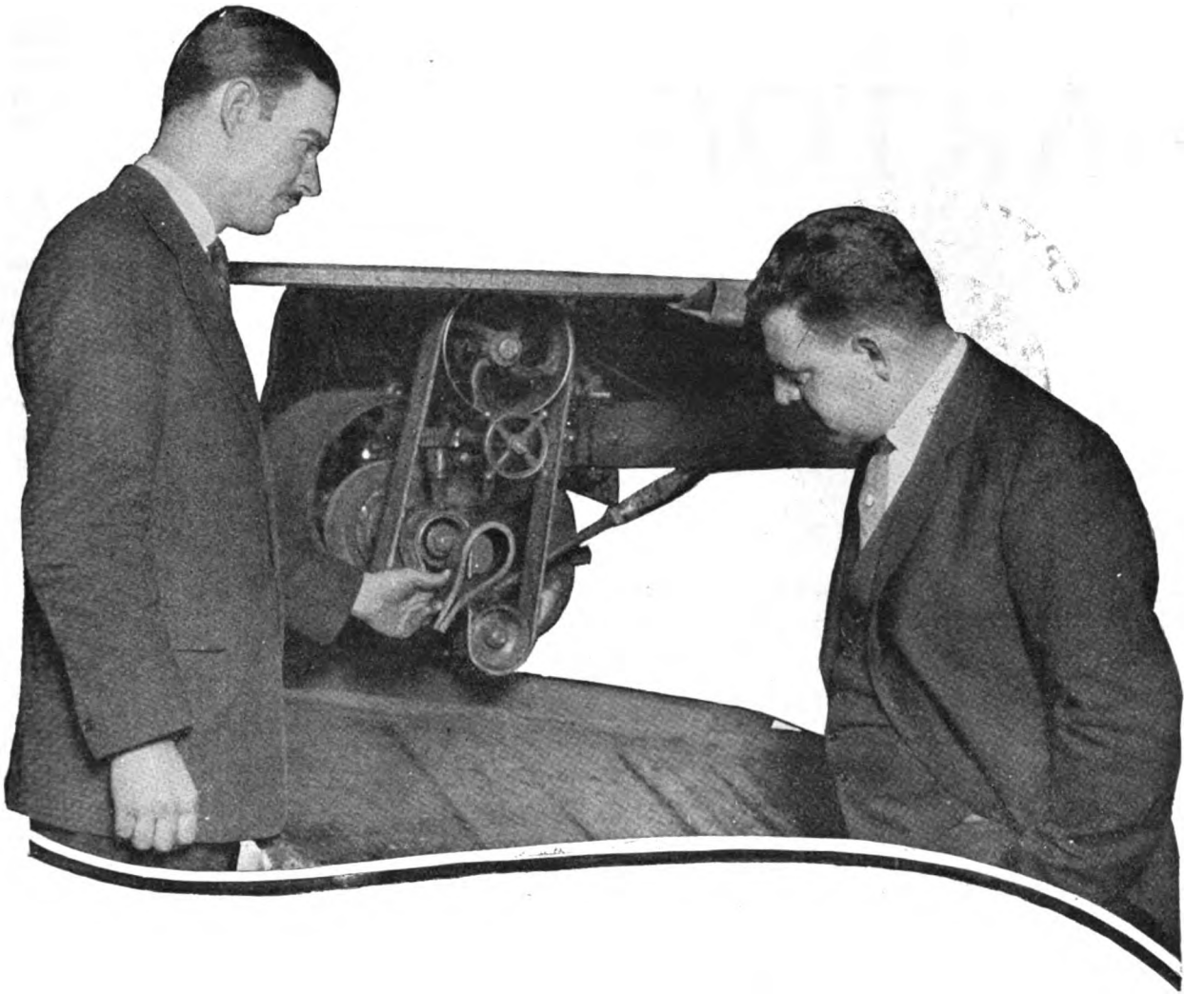
The experience of the Illinois Tool Works is typical of the general change over to steel shelving now in effect by other concerns. Wooden shelves were first used here as elsewhere, largely because lumber costs little and because the shop carpenter could quickly and at low labor cost erect any number required. But this equipment did not stand up under continued hard service nor was it able to bear heavy items. Eventually it was decided that iron shelves could be made right in the shop. These served the purpose, but they were too heavy and expensive. Since the advent of the modern type, however, the company has forsaken its home-made type for the standard steel type.

The maintenance engineer at this plant is high in his praise for steel shelving.

"Steel shelves have certainly proved their worth for our needs," he says. "I haven't any definite figures to just how much they have speeded up our production but I am sure that the total is high. It is important that our men be given their supplies promptly instead of being

(Continued on page 56)

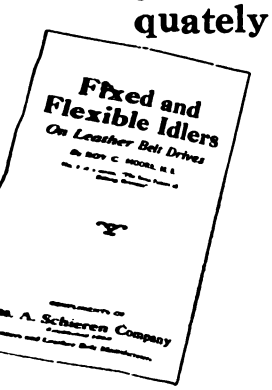
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These are the belts for *small* pulleys
(*because they are more pliable*)

Small pulleys require the most pliable belting. It has got to be able to *get down and bend,* perhaps a thousand times a minute. Flex a piece of stiff belting in your hands and see how inadequately it meets the demands of small pulleys.

Duxbak Belting always lasts longer on small pulleys just because it is pliable The next time you buy belting for small pulleys make sure it is pliable belting.



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Abrasives for Ever

For pr *in this issue write Industry Illustrated*

(Continued from page 54)

forced to stand around until the objects they desire are finally located in some hidden nook. While we used to have a lot of irritation from this source, today our stock keeper fills their requirements with no undue loss of time. This saving alone justifies the investment, in my opinion."

With all these points in its favor, why hasn't sheet steel equipment been adopted by every company? The answer is obvious. The old shelves represent a considerable investment and their owners are loath to replace them at further expense with new equipment. Nevertheless, in many instances, manufacturers have found it worth their while to effect a complete substitution, feeling that the resulting benefits will repay them. Others, however, are making their change to steel a gradual one, installing new equipment section by section, from time to time.

The accompanying photographs show actual installations throughout the country in diversified industries. Note the orderliness in each case; the many different varieties and sizes of bins available for each individual item; and the ease with which the shelves carry the heavy stock.

Of course, no one can claim that sheet steel shelving is a cure-all for our storage ills. The degree of its efficiency depends on the user. Nevertheless, there is no question but that this equipment, adequately installed and properly arranged to meet individual requirements, represents an investment that will pay attractive dividends. Steel shelving should continue to keep pace with present day demands for efficiency.

"A place for everything—everything in its place." Therein lies the answer to "Why Sheet Steel?"

Coming Conferences

THE annual meeting of the Power Transmission Association will be held in the West Ballroom of the Commodore Hotel, New York City at 10 A. M., December 7th, 1927. The Merchandising Advisory Committee will report, as well as the Committee on Surveys. Later in the day, the meeting will be addressed by William Staniar, Belting and Transmission Engineer, E. I. du Pont de Nemours and Company. His subject will be "Mechanical Power Transmission Economies." The recommendations of the Board of Advisory Engineers of which Mr. Staniar is chairman, will be presented during the afternoon session.

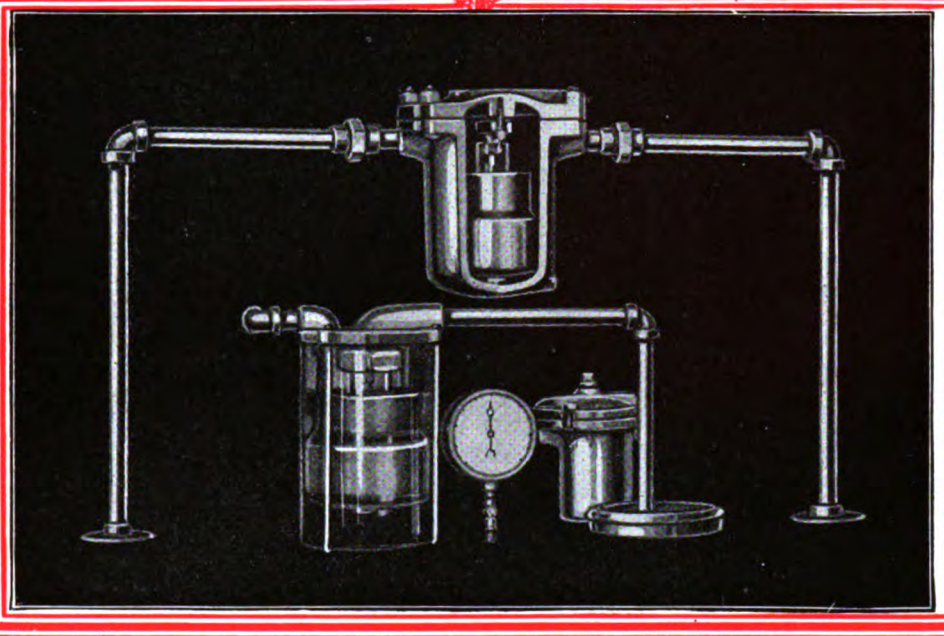
* * * * * *

THE 30th annual convention of the American Mining Congress is to take place at the Mayflower Hotel, Washington, D. C., December 1st to 3rd. Some of the topics which will be discussed are: Mining, the Keystone of Industry; Legislating for Natural Resources; States' Rights, Individual Initiative and Centralized Government; Modification of Anti-Trust Laws; Mine Taxation; and Progress in the Mining Industry.

The speakers include Hon. Herbert Hoover, Secretary of Commerce; Governor Albert C. Ritchie; Senator T. L. Oddie; Chairman William R. Green of the House Committee on Ways and Means; Martin W. Littleton; Walter Teagle; and a distinguished roster of others in public and corporate life.

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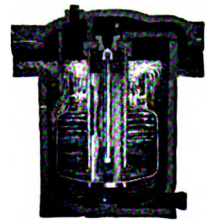
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See This Glass Model in Operation

at the Power Show—Booth 232-233

A FEATURE attraction—a glass model of the three-quarter inch No. 35 Eclipse Steam Trap—operating under actual working conditions. It will illustrate the remarkable snap action—the instantaneous opening and closing of the valve. It will also demonstrate the extreme separation of valve and seat when open, whereby wire drawing, scoring and cutting are eliminated. There will also be on display a complete line of Steam and Vapor Specialties.



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Be sure to visit us and get acquainted with this remarkable trap.

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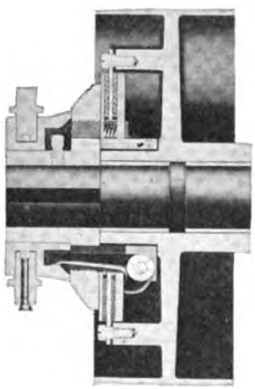
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offer the Complete Answer to the Problem of

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There are three principal types, namely:

The new Disc Clutch, a radical departure in design, in adjustment, in engagement and release. A disc type clutch with centripetal action, accurate and rigid adjustment, complete enclosure, underslung levers, interchangeable parts, inherent balance, full length bearing for loose member, and steel discs, it offers to the clutch user, a clutch of superior design, construction and workmanship.





The Compression Clutch, a contracting band type for rough usage, with full floating friction band, one point accessible adjustment easy engagement, quick release, drag free idling and surprising power capacity.

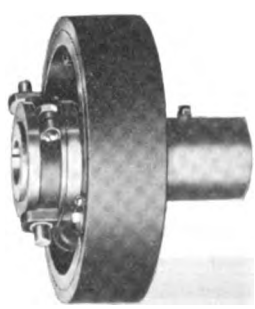
The Expansion Clutch, a full floating band type clutch, with all the features of the compression type, and including a (cut steel) gear and pinion accessible adjustment. Adaptable to enclosure; neat in appearance, and suited to external break mounting for hoists, dredges, concrete mixers, etc.

Besides these three principal types, there are:

One Revolution Clutch (an automatic or foot treadle Knock-out Clutch), obtainable either in compression or expansion type.

Split Clutch — The Compression Clutch, but designed absolutely collapsible, all parts interchangeable, removable, replaceable.

CM 4—The Baby Expansion Clutch, for light machinery, electric washers, printing, textile, shoe repair, addressing and packaging machinery.



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Sixth National Exposition of Power and Mechanical Engineering

EACH year developments in the field of power and power transmission have brought out some new feature that has, to some extent, added to the efficiency in operation and economies to the users of such equipment. These developments are of such importance to the world that they must be shown and exhibited to the best possible advantage to the manufacturers of such equipment.

The year of 1926 found practically four floors of the Grand Central Palace occupied and 103,030 visitors from all over the world during the week of the Show. The coming Sixth Exposition of Power and Mechanical Engineering promises even greater results, both from the number of exhibitors and the attendance when it opens on December 5-10 in the Grand Central Palace, New York City. Probably nowhere else in the world is there a collection of such a diverse number of manufacturers of equipment devoted to the field of power and mechanical engineering as at this Exposition, or the opportunities for first hand discussion of the mechanical problems by plant executives and engineers with the manufacturers of these various appliances. The exhibits devoted to power and power transmission will contain the latest engineering developments and the methods of economical operation.



The Grand Central Palace in New York City where the Power Show will be held.

It will be of interest to know that during the Exposition the annual meeting of the A. S. M. E. will be in session at headquarters and most of the Society's activities will be in addition after the meetings. As this Exposition has been growing it difficult to accommodate for exhibits that they Show.

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Fourteen years experience ~ boiled down and proven ~ dictated the design of this unit. Note that ~

~ *the operator's position is at the front* ~ where he has clear, unobstructed vision and is protected from chance injury.

~ *the steer is by a tiller bar* ~ unequaled for accurate, convenient and speedy manipulation.

~ *the drive axle is the rugged efficient Mercury internal gear type* ~ to withstand the tremendous strain imposed by heavy continuous pulling.

~ *the unit is full spring suspended* ~ to absorb the shocks of rough going, cushion the mechanism and provide comfortable riding for the operator.

For an interesting story of industrial tractor development request Bulletin No. 110.

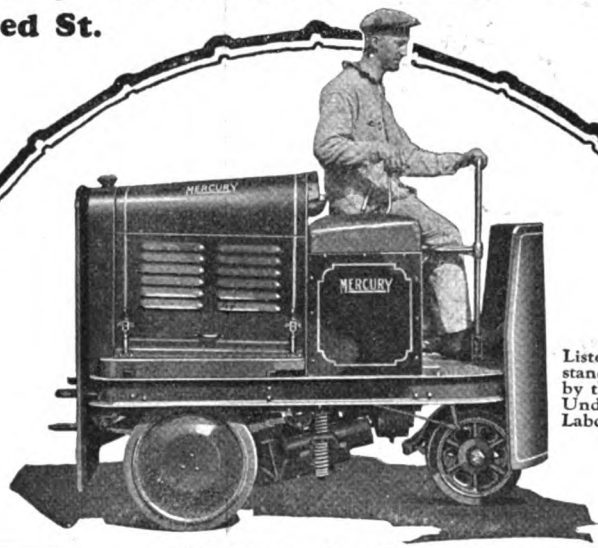
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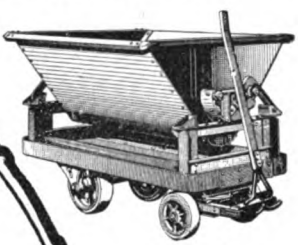
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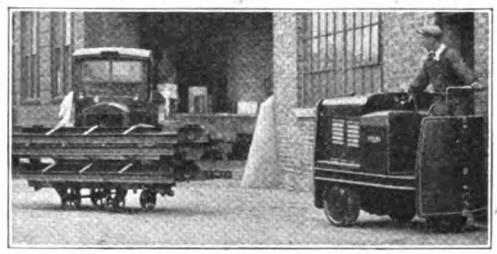
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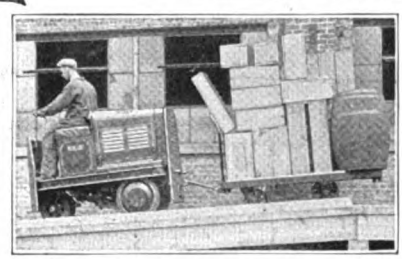
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Driver can always SEE where he is going

Tiller bar steer best for accurate "back-up"





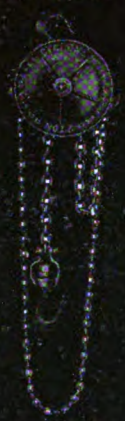
No falling loads can injure operator

The Trackless Train

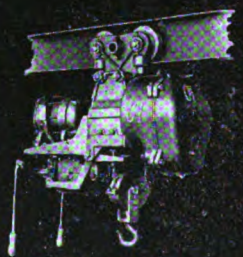
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Model K Cyclone



Electric Hoist



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The Most Efficient, Most Economical and Longest Lived, Light-Weight, High-Speed, Hand Chain Hoist Ever Built

The C-M Model K Cyclone

Built in ¼ to 6 ton capacities

The Model K one-ton hoist is the *Most Efficient*—it is 90% efficient—10% greater efficiency than other one-ton high-speed hoists,

Most Economical—it requires 18% less effort to lift the load than other one-ton high-speed hoists,

Longest-Lived—it has anti-friction bearings in all rotating parts; is built of special alloy steels and metals; operates in grease packing in a dust-proof, oil-tight housing, factors which insure a life—without repairs—considerably longer than that of any other one-ton, high-speed hoist.

These are features that mean important money savings—in quicker production, less labor time required, considerably less investment in hoist equipment, and the almost complete elimination of maintenance bills.

All Model K sizes are proportionately light, efficient, economical and long-lived. The Model K literature describes their construction and operation and shows clearly why they offer an unequalled savings opportunity. Write for it today.

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5032 Lakeside Ave. Cleveland, Ohio
Branches: New York, Philadelphia, Chicago, Pittsburgh
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CHISHOLM-MOORE
CHAIN HOISTS — CRANES, TROLLEYS, CUPOLA CHARGERS — ELECTRIC HOISTS

STOP WASTING MEN—GET A C-M IDEA

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THESE features make the Model K the most efficient, most economical and longest-lived lightweight high-speed chain hoist you can buy.

1.
Anti-friction bearings in all rotating parts.

2.
Load wheel and gears of special alloy steels insuring long life and safety.

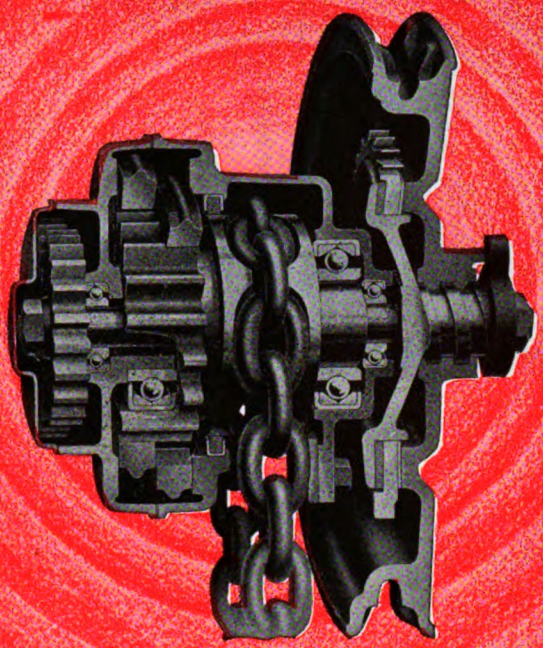
3.
All moving parts packed in grease in a dust-proof, oil-tight housing. It needs refilling only once a year under ordinary usage.

4.
Steel swivel hooks, drop forged, heat treated and proof tested. Lower hook is equipped with a Timken thrust bearing.

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Special, electric welded, heat treated and proof tested chains. Guaranteed the strongest and best wearing chain obtainable—insuring safety again.

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320 Hours' Continuous Operation

THAT'S the record which has definitely taken the Model K Cyclone out of the category of "Improved Models" and has marked it as setting entirely new long-life hoist standards.

In a test, a one-ton Model K Cyclone, chosen at random from stock, was operated continuously lifting a one-ton load, day and night, for 320 hours—the equivalent of lifting and lowering 38,400 one-ton loads.

At the end of 320 hours the hoist was taken apart and thoroughly examined.

Not a defective part and very little sign of wear could be found in the hoist mechanism.

When it is considered that under exactly similar test conditions other one-ton hoists rarely reach the two-hundred hour mark without requiring some sort of replacement part, the true significance of our Model K guarantee is quickly understood—"Longest-Lived Without Repairs."

That guarantee is your assurance that the Model K Cyclone is the most economical hoist you can buy—in point of years of service, of low maintenance bills and savings in labor, time and expense.

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5032 Lakeside Avenue Cleveland, Ohio

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Representatives in All Territories for Prompt Service.

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CHAIN HOISTS — CRANES, TROLLEYS, CUPOLA CHARGERS — ELECTRIC HOISTS

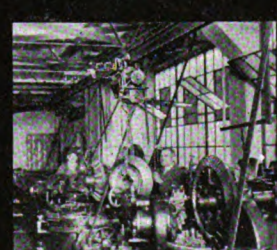
C-M ideas have stopped wasting men in these plants. They can do the same for you.





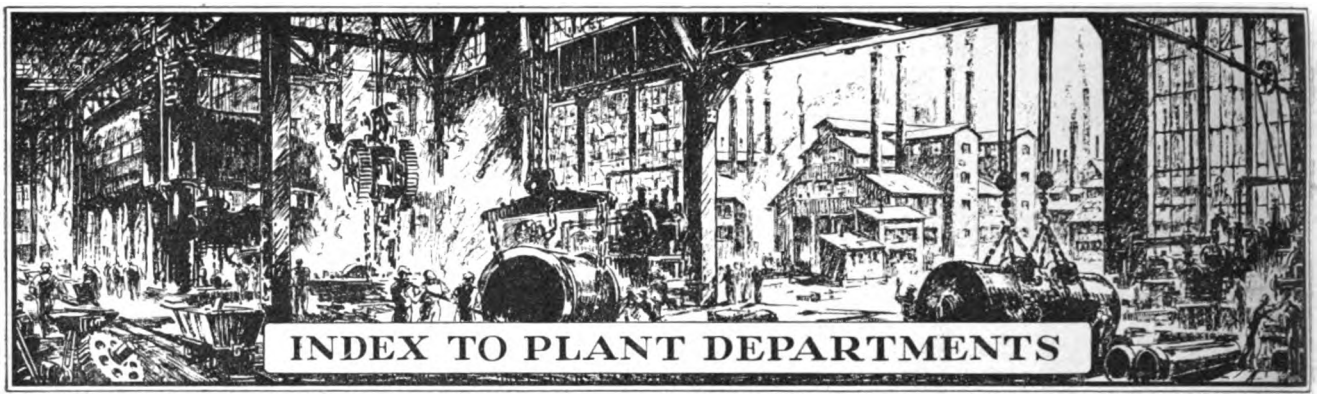








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What Advanced Heat Treatment Is Doing for Industry

By E. J. Tournier

HOW many among our readers and contributors are there, who would be willing to accept as a possibility that the future metallurgist may be able to "write a prescription" for an alloy of definite properties. Nevertheless, such a prediction was made recently by one who presumably had good reasons for the prophecy.

Improved methods and optical instruments, have made it possible to break up some structures which had been considered as solid solutions. We are now able to vizualize what happens when hardened steels are tempered. In some cases the changes in structure arising from the addition of a few hundredths of one per cent of the alloying element can be observed. This is made visible and is permanently recorded in the form of micrographs. It follows, then, that if the desired properties of a given machine part, to be made of steel, are known, they can be supplied almost at will, with a number of alloys. A micrograph will furnish a diagram of the metallic structure, and a suitable alloy with heat treatment, perhaps, will add the necessary qualities.

In mass production of parts the value of accurate advance knowledge and of the probable results of a process are essential. As an example may be cited, the production of automotive springs, requiring over 15 million units in 1926. The greater part of these springs are of identical dimensions, and all must be of uniformly high quality. The necessity for such a great quantity of springs has resulted in the development of a highly specialized and technically controlled industry. It was soon realized in this industry, however, that only by the use of alloy steel, properly heat treated, could the necessary combination of high elastic limit, toughness and resiliency, be obtained. Metallography and magnetic analysis permit not only the production of identical millions of parts, but also the graphic proofs that these parts are alike.

In foundry practice, heat-treating methods have brought such improvement in annealing castings, that the latter have properties considered unattainable ten years ago. The most notable advance, however, has been made in iron castings. Annealing and normalizing gray iron castings are now commercial realities. Iron castings are now more difficult to heat-treat than steel castings, principally because the former have a greater number of structural components; and these are not in a state of equilibrium. Cast iron is easily formed into intricate shapes, which always mean difficulties in heat-treatment. Also, at high temperatures, cast iron frequently expands permanently, which further increases the difficulty.

One of the principal uses of heat treatment of iron castings is in relieving them of casting or other internal stresses. Improved methods and processes now make possible "normalizing" operations successfully on castings from a few pounds up to 25.000 lbs.

The saving effected by the reduction of breakage more than offsets the additional process cost.



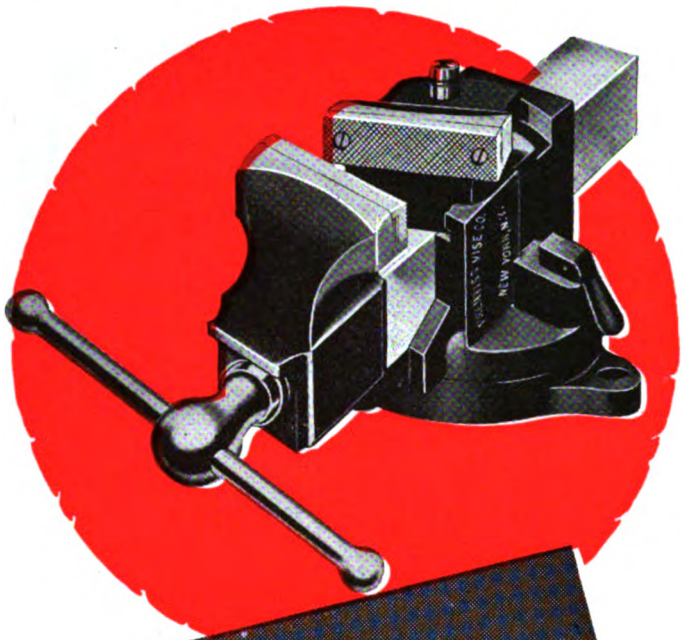
Fig. 1. Manganese steel, condition as cast. Etched in picric acid and sodium picrate. Magnified 200 diameters.



Fig. 2. Section from small manganese casting, heated to 1825 Deg. Fahr. and quenched in water, etched in picric acid; magnified 200 diameters.

(See next page)

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Diagonal Strapping of Crates

THE recent development of a new method of bracing crates with tensioned diagonal straps, offers many possibilities to shippers. This is not the first time strapping has been used to diagonally brace a crate, in place of wood diagonals, but it is the first time that endless bands under tension have been used.

For some time, straps have been used to diagonally brace a crate, but they have been stretched from corner to corner and nailed and the ends have not been sealed; but this is a slow process and not very effective, as the bands are relatively loose.

With the new method, two continuous bands are used, and they are so stretched around the corners and under the slats that they diagonally brace both sides and both ends of the crate and can be applied very quickly.

Some of the advantages of diagonal strapping under tension are:

(1) It is cheaper than bracing with wood. Diagonal strapping under tension eliminates the wood diagonal braces on four faces of the crate, saving from 4 to 8 pieces of lumber according to whether the crate has

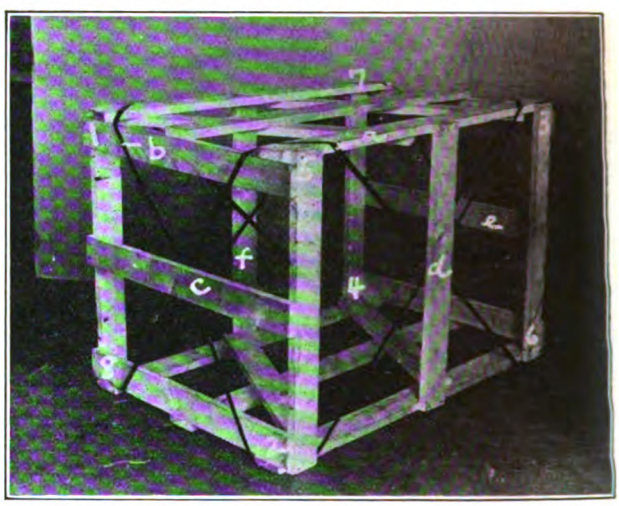


Fig. 1. The proper method of applying metal straps to brace a wooden shipping crate. This method of bracing is comparatively new and serves to strengthen the crate materially.

double or single diagonals. It can be applied just as quickly, and all the bother of mitre sawing of the wood diagonals is eliminated.

(2) There is a saving in shipping weight. The diagonal straps weigh only a fraction as much as the wood braces and a considerable amount of shipping weight is saved.

(3) It also offers a saving in space. The diagonal straps occupy practically no space, while wood diagonals very often increase the size of the crate by an amount equal to their thickness. It often happens that the extra space occupied by the wood diagonals is just enough to prevent getting another row of crates in the freight car. The saving of space is also valuable in warehouse storage.

(4) It is also an aid in recoopering of crates in freight houses. The railroads have to repair and strengthen many crates in the freight houses to prevent subsequent damage to contents, and it is much simpler to put on diagonal bands than to saw out wood diagonals and nail them on.

(Continued on page 66)

...s not advertised in this issue write Industry Illustrated

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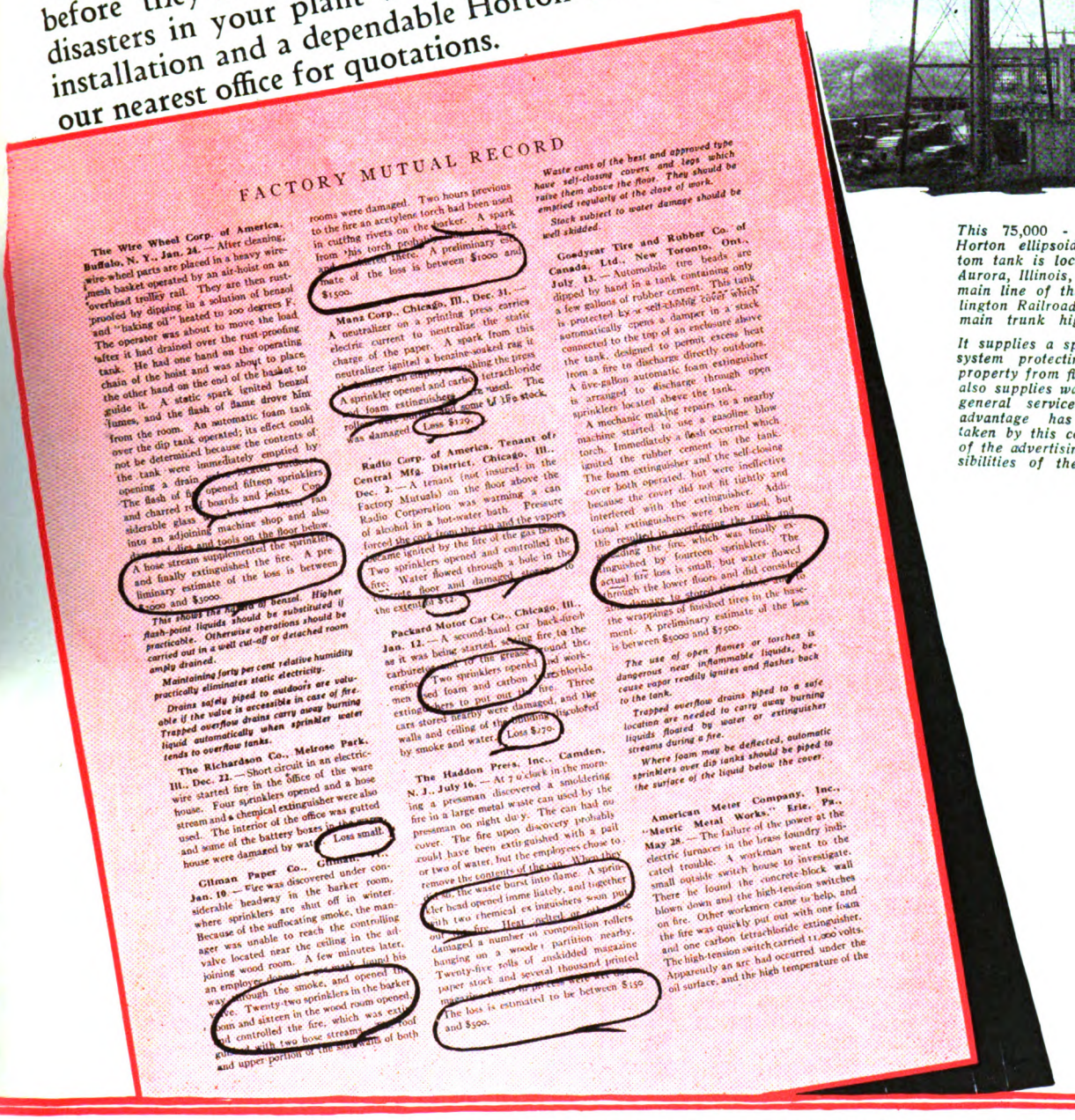
Disasters that were prevented!

IN every one of the cases shown in the reports reproduced below, a Horton Tank supplied the water to sprinklers which stopped industrial fires before they had a chance to become big. Prevent disasters in your plant with an adequate sprinkler installation and a dependable Horton Tank. Write our nearest office for quotations.



This 75,000 - gallon Horton ellipsoidal-bottom tank is located at Aurora, Illinois, on the main line of the Burlington Railroad and 2 main trunk highways.

It supplies a sprinkler system protecting the property from fire, and also supplies water for general service. Full advantage has been taken by this company of the advertising possibilities of the tank



FACTORY MUTUAL RECORD

The Wire Wheel Corp. of America, Buffalo, N. Y., Jan. 24. — After cleaning, wire-wheel parts are placed in a heavy wire-mesh basket operated by an air-hoist on an overhead trolley rail. They are then rust-proofed by dipping in a solution of benzol and "baking oil" heated to 200 degrees F. The operator was about to move the load after it had drained over the rust-proofing tank. He had one hand on the operating chain of the hoist and was about to place the other hand on the end of the basket to guide it. A static spark ignited benzol fumes, and the flash of flame drove him from the room. An automatic foam tank over the dip tank operated; its effect could not be determined because the contents of the tank were immediately emptied by opening a drain. The flash of fire opened fifteen sprinklers and charred roof boards and joists. Considerable glass was broken. Water ran into an adjoining machine shop and also damaged tools on the floor below. A hose stream supplemented the sprinklers and finally extinguished the fire. A preliminary estimate of the loss is between $2000 and $3000.

This shows the hazard of benzol. Higher flash-point liquids should be substituted if practicable. Otherwise operations should be carried out in a well cut-off or detached room amply drained.

Maintaining forty per cent relative humidity practically eliminates static electricity.

Drains safely piped to outdoors are valuable if the valve is accessible in case of fire. Trapped overflow drains carry away burning liquid automatically when sprinkler water tends to overflow tanks.

The Richardson Co., Melrose Park, Ill., Dec. 22. — Short circuit in an electric wire started fire in the office of the ware house. Four sprinklers opened and a hose stream and a chemical extinguisher were also used. The interior of the office was gutted and some of the battery boxes in the ware house were damaged by water. Loss small.

Gilman Paper Co., Gilman, Ill., Jan. 10. — Fire was discovered under considerable headway in the barker room, where sprinklers are shut off in winter. Because of the suffocating smoke, the manager was unable to reach the controlling valve located near the ceiling in the adjoining wood room. A few minutes later, an employee opened a window and found his way through the smoke, and opened the valve. Twenty-two sprinklers in the barker room and sixteen in the wood room opened and controlled the fire, which was extinguished with two hose streams. The roof and upper portion of the side walls of both rooms were damaged. Two hours previous to the fire an acetylene torch had been used in cutting rivets on the barker. A spark from this torch probably ignited the shack [illegible] there. A preliminary estimate of the loss is between $1000 and $1500.

Manz Corp., Chicago, Ill., Dec. 31. — A neutralizer on a printing press carries electric current to neutralize the static charge of the paper. A spark from this neutralizer ignited a benzine-soaked rag in the [illegible] A sprinkler opened and carbon tetrachloride fire extinguishers were used. The roll of foam extinguishers [illegible] some of the stock was damaged. Loss $129.

Radio Corp. of America, Tenant of Central Mfg. District, Chicago, Ill., Dec. 2. — A tenant (not insured in the Factory Mutuals) on the floor above the Radio Corporation was warming a can of alcohol in a hot-water bath. Pressure forced the cork from the can and the vapors became ignited by the fire of the gas [illegible] Two sprinklers opened and controlled the fire. Water flowed through a hole in the concrete floor and damaged stock to the extent of $12.

Packard Motor Car Co., Chicago, Ill., Jan. 12. — A second-hand car back-fired as it was being started, setting fire to the carburetor and to the grease around the engine. Two sprinklers opened and controlled the fire. Three men used foam and carbon tetrachloride extinguishers to put out the fire. Three cars stored nearby were damaged, and the walls and ceiling of the building discolored by smoke and water. Loss $270.

The Haddon Press, Inc., Camden, N. J., July 16. — At 7 o'clock in the morning a pressman discovered a smoldering fire in a large metal waste can used by the pressman on night duty. The can had no cover. The fire upon discovery probably could have been extinguished with a pail or two of water, but the employees chose to remove the contents of the can. When they did so, the waste burst into flame. A sprinkler head opened immediately, and together with two chemical extinguishers soon put out the fire. Heat ruined or damaged a number of composition rollers hanging on a wooden partition nearby. Twenty-five rolls of stockidded magazine paper stock and several thousand printed [illegible] The loss is estimated to be between $150 and $500.

Waste cans of the best and approved type have self-closing covers and legs which raise them above the floor. They should be emptied regularly at the close of work.

Stock subject to water damage should be well skidded.

Goodyear Tire and Rubber Co. of Canada, Ltd., New Toronto, Ont., July 13. — Automobile fire beads are dipped by hand in a tank containing only a few gallons of rubber cement. This tank is protected by a self-closing cover which automatically opens a damper in a stack connected to the top of an enclosure above the tank, designed to permit excess heat from a fire to discharge directly outdoors. A five-gallon automatic foam extinguisher is arranged to discharge through open sprinklers located above the tank.

A mechanic making repairs to a nearby machine started to use a gasoline blow torch. Immediately a flash occurred which ignited the rubber cement in the tank. The foam extinguisher and the self-closing cover both operated, but were ineffective because the cover did not fit tightly and interfered with the extinguisher. Additional extinguishers were then used, but this resulted in overturning the tank and extinguishing the fire, which was finally extinguished by fourteen sprinklers. The actual fire loss is small, but water flowed through the lower floors and did considerable damage to stored [illegible] the wrappings of finished tires in the basement. A preliminary estimate of the loss is between $5000 and $7500.

The use of open flames or torches is dangerous near inflammable liquids, because vapor readily ignites and flashes back to the tank.

Trapped overflow drains piped to a safe location are needed to carry away burning liquids floated by water or extinguisher streams during a fire.

Where foam may be deflected, automatic sprinklers over dip tanks should be piped to the surface of the liquid below the cover.

American Meter Company, Inc., "Metric Metal Works," Erie, Pa., May 28. — The failure of the power at the electric furnaces in the brass foundry indicated trouble. A workman went to the small outside switch house to investigate. There he found the concrete-block wall blown down and the high-tension switches on fire. Other workmen came to help, and the fire was quickly put out with one foam and one carbon tetrachloride extinguisher. The high-tension switch carried 11,000 volts. Apparently an arc had occurred under the oil surface, and the high temperature of the

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Chicago, 2465 Old Colony Bldg. Cleveland, 2238 Union Trust Bldg. Atlanta, 1023 Healey Bldg.
New York, 3169 Hudson Terminal Bldg. Dallas, 1658 Dallas National Bank Bldg. San Francisco, 1043 Rialto Bldg.

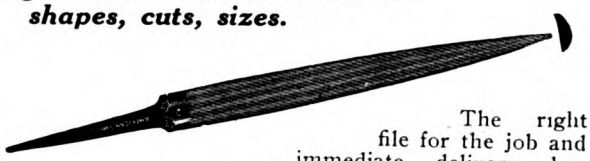
HORTON TANKS

1111-Gray

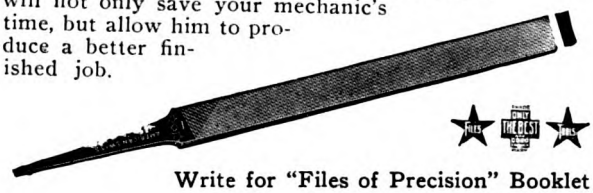
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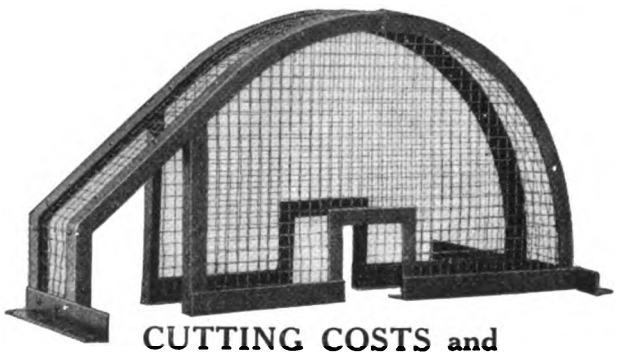
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(Continued from page 64)

In Fig. 1, band B goes from corner 1 to corner 2, to corner 3, to corner 4, and then back to corner 1. Band A goes from corner 5 to corner 6, to corner 7, to corner 8, and then back to corner 5. Note also that both bands are woven under the side and end slats D, F, C and E, this being done so that the band will be brought in beyond the outside surface of the crate, so that it will not tear off. The only band exposed on the outside of the crate is for a short distance around the corners of the crate.

It is possible by using two more bands, to brace the top and bottom of the crate also, but this doubles up the band on two of the crate faces and rather complicates the process. It is preferable to use wood diagonals on the top and bottom faces of the crate as shown in Fig. 2 —pieces A, B, C, and D. These pieces can have square cut ends as shown, and can be nailed to the top and bottom sections of the crate when they are being nailed together in the nailing jig. As a rule, the top and bottom of a crate are made up in sectional form in a crating operation of any size.

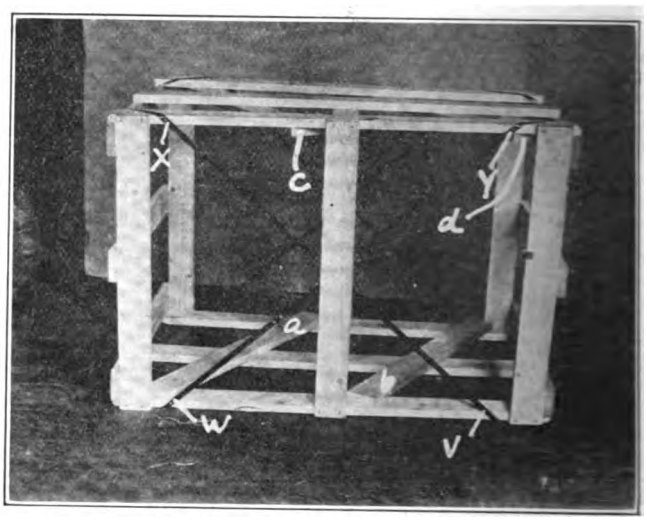


Fig. 2. When metal straps are used to brace a wooden shipping crate, it is suggested that they be nailed as shown.

The strapping of the crate should be done after the contents are in place and after all the slats or pieces have been nailed on. The first band should not be stretched too tightly, as the second band will work against it and tighten it considerably more.

Nailing or stapling the bands as shown at V, W, X and Z is advisable because, if one of the bands should break during the shipment, the bracing effect on the other faces of the crate will not be destroyed.

The bands should be stretched with a "C" Type stretcher, which works very well for this purpose.

For general use on average size crates, 5/8-in. by .020-in. strap is recommended, especially if the bands are nailed as shown in Fig. 2.

Oil Infections

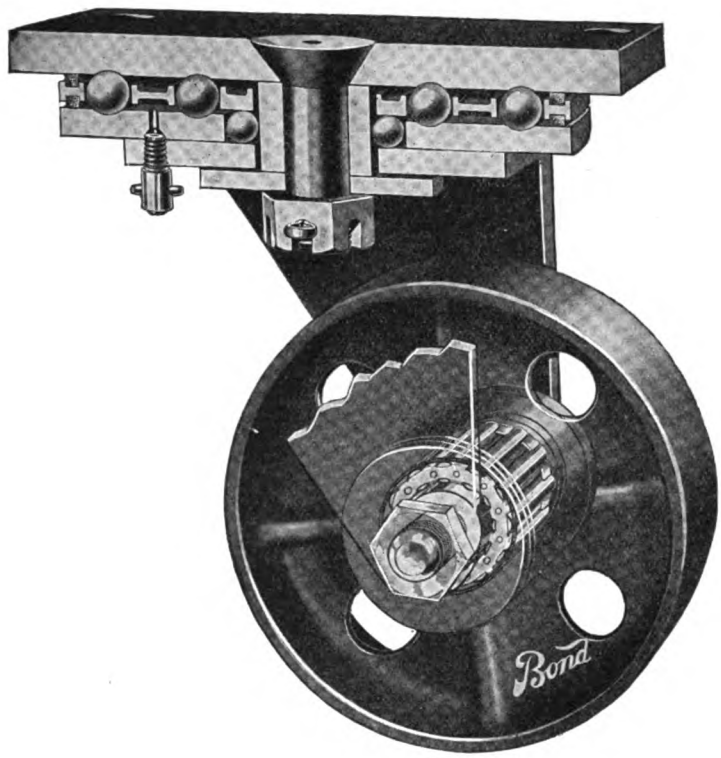
THE frequency of illness and infections among men working with cutting oil has resulted in a thorough investigation and scientific research to determine the cause.

Tests of the oil were made at all stages of processing.

(Continued on page 68)

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STUDY the design of the Bond Ajax Steel Caster pictured above. Note the Triple Ball Race construction—could any caster be more rugged?

The all-steel construction of the Ajax Caster gives unsurpassed strength and ability to resist shocks.

Somewhere in your plant, you have heavy loads to carry. Put them on Ajax-equipped trucks and the problem is solved.

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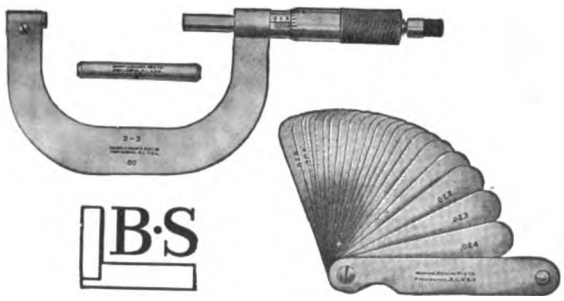
Brown & Sharpe tools have been helping executives lower production costs for nearly 100 years. Their performance sets a standard of accuracy in shops the world over.

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BROWN & SHARPE TOOLS

"World's Standard of Accuracy"

(Continued from page 66)

beginning with new oil, then reclaimed oil and oil in machines.

Cultures were taken from wiping rags—used and newly purchased, and cultures from boils and pimples.

The oil in all the machines tested showed large quantities of pus-forming bacteria and other disease germs. The rags purchased as sterile were really filthy. The pus from infections and boils was found to contain the same family of bacteria as found in the used oil.

The oil stream in even the most modern equipment is not protected against outside contamination. Foreign substances—scraps of food, paper, tobacco—find their way into the oil stream. Germs from coughing, sneezing, spitting, and the millions floating in the air, all contaminate the oil.

One authority says, "Machinists of all sorts have a common enemy in dirty oil which is rubbed into and absorbed by the follicles of the skin, and if boils don't follow eczema may."

Still another writing in the New York Medical Journal and Medical Record, October, 1922, states that it is a common thing to observe in those workers in or with oil a condition either of acne, dermatitis or furunculosis."

The ordinary preventive measures of filtering, centrifuging, or sterilizing the oil, of prompt treatment for minor injuries, removal of infected men, and recommendations to the men concerning the importance of personal cleanliness—all are helpful. But it is necessary to go a step further and keep the oil continuously free from living infectious agents.

A disinfectant was found which is claimed is an effective germ destroyer in oil. Careful tests have been made and the oil from several machines was analyzed again and again. Examination showed literally millions of pus-forming bacteria. Disinfectant was added and the oil analyzed again, after one hour, five hours, ten hours. Not a germ was found. Careful observation established a working formula of one per cent. of the disinfectant for each machine at initial application of the oil and one per cent. to new oil at each subsequent renewal. In some types of machines, however, where the working temperature is some 20 degrees higher and burns out the disinfectant faster, it was found necessary to add one per cent. between renewals.

An unexpected benefit came from the addition of the disinfectant to the oil. Hair follicle rash, from which men working in oil have suffered continually, disappeared. Not only, therefore, was the danger which the oil had offered overcome, but the addition of the antiseptic served as a purifier for skin troubles.

Combination Welding Press

THE welding press shown, is a combination of an automatic spot welder and a punch press. It differs radically from an automatic spot welder in both construction and operation.

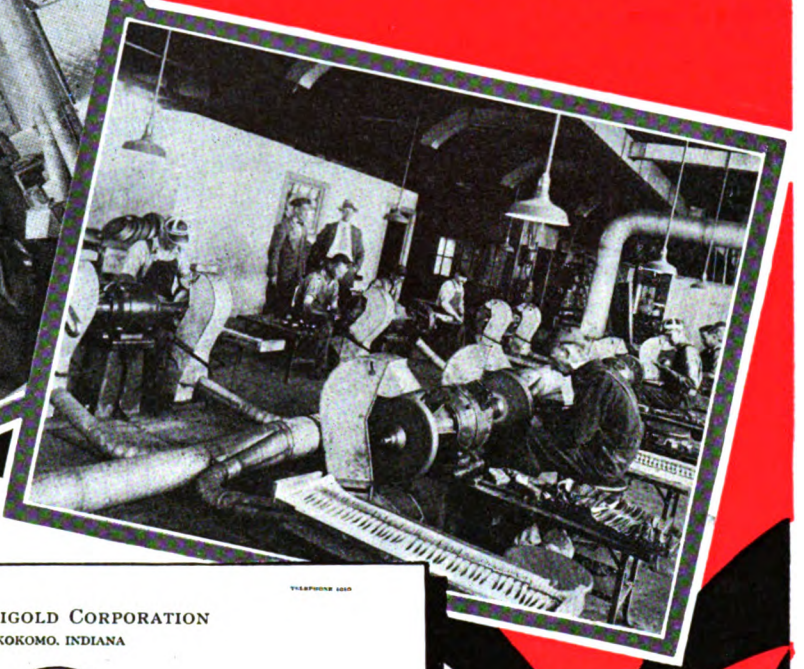
An entirely new principle in spot welding is employed in that where spots are normally made in one

(Continued on page 70)

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Repeat Orders!





The Dirigold Corporation, Kokomo, Indiana, bought six Black & Decker Buffers a year ago. Since then, they have sent in two repeat orders, bringing their total of Black & Decker Buffers up to seventeen.

THE DIRIGOLD CORPORATION
KOKOMO. INDIANA

Dirigold

July 11, 1927

The Black & Decker Manufacturing Co.,
Towson, Maryland.

Attention: Mr. B. Black, Manager

Gentlemen:

We wish to express in a few words our appreciation of the service as rendered by the Black & Decker Grinding and Buffing machines which we installed in our factory a year ago.

After a careful investigation of the most prominent grinding machines, we decided to purchase the Black & Decker make. Our first purchase was for six buffers, ranging from one to five H.P.

The machines proved all that was claimed of them and the adaptibility for the purpose to which we have put them has even exceeded our expectations.

We have already made two additions to our originally planned system and have now seventeen of your machines.

We feel that the added facility with which our production is handled, due to the installation of your machines, will in time return the cost and we are already contemplating still further additions of your machines for our polishing and grinding department.

It is because of the real merit of your machines that we are pleased to express our gratification in the service it has already given, as well as in the prospect of their continued reliability.

Yours very truly,

THE DIRIGOLD CORPORATION

Oscar von Malmborg

President

OVM:LF

Our Experts will be glad to analyze your grinding and buffing problems without obligation.

Complete line of Black & Decker Grinders and Buffers is described in our catalog, which will be sent free on request.

The BLACK & DECKER MFG. CO.

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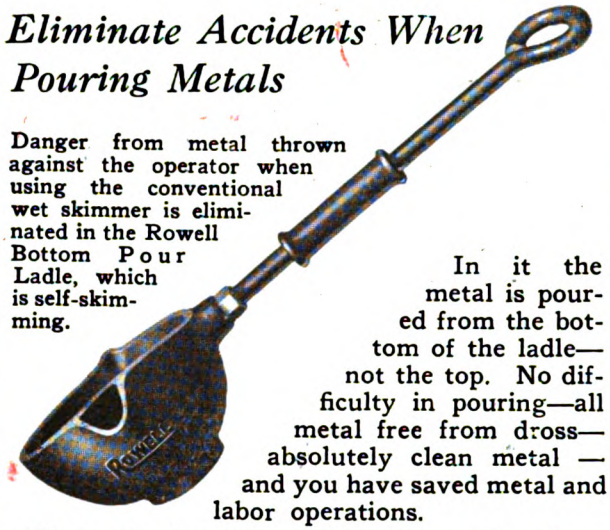
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Eliminate Accidents When Pouring Metals



Danger from metal thrown against the operator when using the conventional wet skimmer is eliminated in the Rowell Bottom Pour Ladle, which is self-skimming.

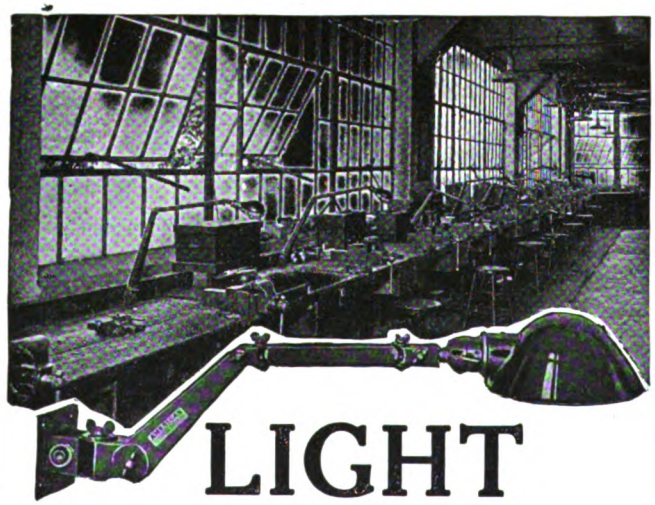
In it the metal is poured from the bottom of the ladle—not the top. No difficulty in pouring—all metal free from dross—absolutely clean metal — and you have saved metal and labor operations.

These are the outstanding reasons why plants everywhere are rapidly adopting Rowell Bottom Pour Ladles. Let us tell you more about them.

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Let us tell you why your workbenches, machines, etc., should have the aid of American Fixtures. Write for information.

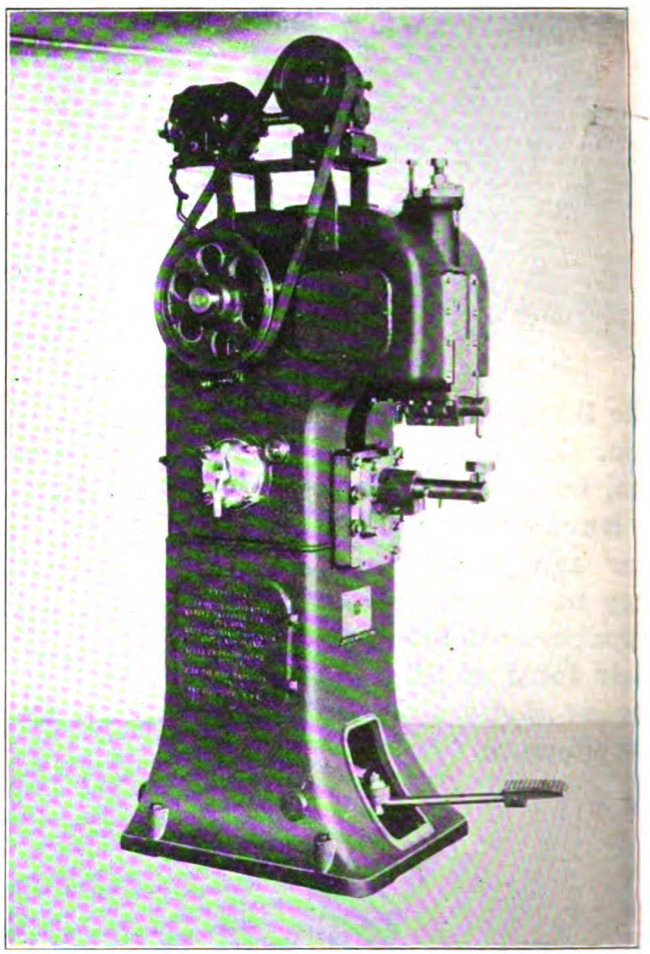
American Fixture Company
230 West Water Street
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(Continued from page 68)

second the welding press makes spots in one hundredth part of a second. This is accomplished by means of an especially designed transformer and a precisely timed automatic switch.

The transformer in its action has the characteristics of a condenser, discharging its current with lightning-like swiftness. The object of this new principle in spot welding, quite aside from speed of operation, is to make welds eliminating depressions in the surface, warpage, and discoloration. The weld is made before the heat has an opportunity to soften the outer surfaces of the sheet. Welds can be made at the rate of two hundred or more spots per minute.

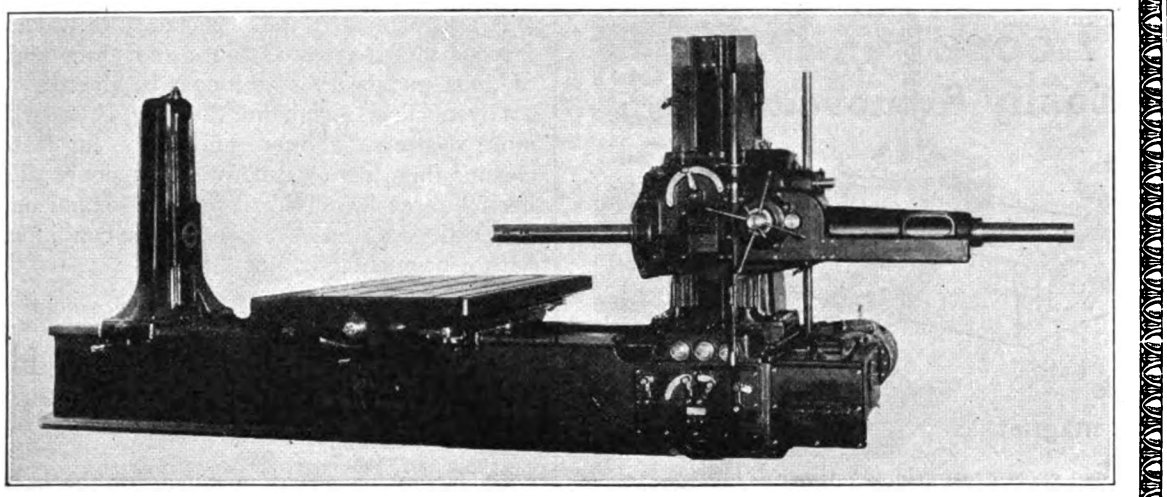


The welding press has a smooth toggle action which quickly brings the welding points lightly into contact with the work and a final forging pressure which can be without limit. The usual hammering of copper points is absent. This smoothness of action not only insures long life to the moving parts but more particularly, together with the instantaneous heating, preserves the welding points, eliminating constant re-dressing with the consequent loss of production.

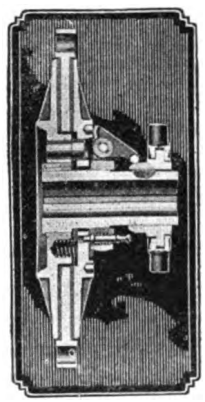
Particular fields of application are in the more difficult and more precise welding of light to heavier parts. It is suitable for finely polished surfaces, where finish counts, such as automobile bodies. Other applications are in welding spouts to bodies of oil cans, coffee pots, tea kettles, in welding rivets, pins, or any shaped rods to flat surfaces, or in attaching ears, clips, or lugs to containers. A special double acting Welding Press is

(Continued on page 72)

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A h avy duty job for the Twin Disc Clutch in a No. 45 Giddings & Lewis Boring Machine



PARTS STATIONS

Boston (25), Mass—Standard Auto Gear Co., 531 Columbia Road.
Buffalo, N. Y.—Edward W. Rode, 45 A. Street.
Cleveland—James R. Howell, 6715 Quimby Avenue.
Chicago—Motive Parts Co. of America, Inc., 2419 Indiana Avenue.
Des Moines—Motive Parts Co. of America, Inc., 1204 W. Grand Avenue.
Detroit—Whitney Brothers, 6464 Epworth Boulevard.
Los Angeles—Coast Machinery Corporation, 406 E. Third Street.
New York City—E. George & Co., Broome & Wooster Streets.
Philadelphia, Pa.—Maerky Machine Works, 240 Cherry St.
Pittsburgh, Pa.—Motive Parts Co. of Pa., 6314 Penn Avenue.
Raleigh, N. C.—Motor & Equipment Co., 215 E. Davie Street.
San Francisco—F. Somers Peterson Co., 57 California Street.
Tampa, Fla.—Motive Parts Co. of Florida, Inc., 708 Twiggs Street.
Tulsa, Okla.—Buda Engine Service Co. of Tulsa, Inc.

INCREASED working capacity in a machine tool through greater flexibility of the drive, is a distinct sales advantage.

Where the Twin Disc Clutch is used it relieves the power unit of strain, smooths the operation of the machine and enables the operator to turn out more and better work.

Adjustments by .005″ can be made in a few seconds, without the use of tools—a distinct time-saving advantage.

The facilities and resources of this organization are at your service and our experienced engineers will gladly analyze your drive problems, without cost to you. *Write!*

TWIN DISC CLUTCHES

TWIN DISC CLUTCH COMPANY

RACINE WISCONSIN

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Can't Work Loose

Yet Easily Removed

Like the electric magnet

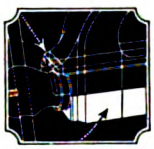
which can exert great gripping power or release its load at will, the jaws of a Parker Vise are fitted tight to stay on a lifetime or they can be easily removed if necessary.

Parker vise jaws are made of steel, carefully milled and fitted, and pinned on. Their construction has been a feature of this famous vise for 85 years. Write to W. R. B. for latest catalog.

Other Exclusive Features of Parker Vises



Swivel Base 360° Gripping Power



Solid Underportion in Slide



Handle Stays Put

PARKER VISES

Meriden, Conn., U. S. A.

GRIP LIKE A GRIZZLY

ARMSTRONG

TOOL HOLDERS



90% of the shops in the country are using them to cut maintenance costs and increase production.

SAVE:

ALL Forging
70% Grinding
90% H. S. Steel

Write today for your free copy of Catalog B-27 which shows the complete ARMSTRONG Line, with descriptions, sizes and prices.

Armstrong Bros. Tool Co.

"The Tool Holder People"

318 N. Francisco Avenue

CHICAGO, ""

(Continued from page 70)

here employed whereby two spots are made at one stroke.

It is useful for welding hardware parts such as locks, catches, and so on, where rivets are now used.

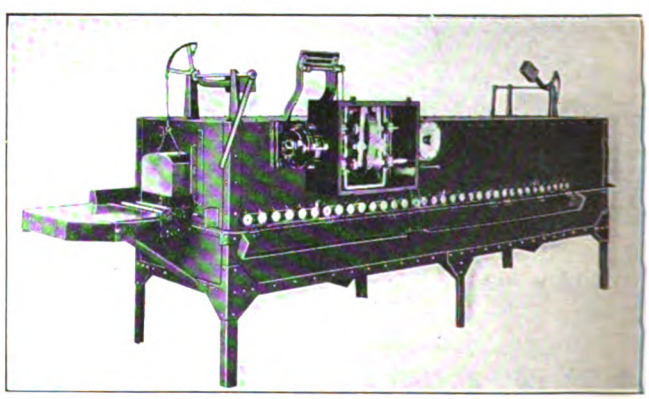
It also eliminates the uncertainty in welding the non-ferrous metals such as brass and aluminum. Utensils of these metals need no longer be riveted.

Given clean metal the Welding Press will weld far more securely, far more uniformly, far faster, and far cleaner than has ever before been done. The machine itself and each individual part will stand up far longer under the most severe production conditions than has before been thought possible.

Continous Electric Roller Hearth Furnace

THIS furnace was installed for the heat treatment of automobile valve and other springs.

The furnace is of the continuous type, the hearth being formed by a series of heat resisting metal rolls, these rolls being driven by two constant speed motors through a series of chains and worm gear reduction units, the driving mechanism being so constructed that by means of a variable speed transmission unit speed changes will be obtainable to insure the time travel of material through the furnace of from 5 minutes to 30 minutes or from .5 feet per minute to 3 feet per minute. A speed indicator is mounted on the variable speed transmission unit indicating the relative speeds of the work passing through the furnace, thereby enabling the operator to exactly duplicate the heating conditions on the various sizes of material heat treated. This mechanism because of the design and material used, will have a long life and will not be appreciably impaired by continuous use.



The electric heating elements are designed to operate on a power supply of 55 volts—3 phase, and are divided into three control zones each section having a connected load of 33 1/3 kw. making the entire connected load of the furnace 100 kw. Each zone is independently controlled. The first zone at the charging end is maintained at 1550 deg. F. while the temperature of the center zone is 1600 deg. F., and the zone adjacent the discharge is maintained at 1630 deg. F.

An automatic quenching tank consisting of an end-

(Continued on page 74)

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"Red Shield" High Speed Drills



With 46 Years' Experience

we pronounce the *Red Shield* the best Drill yet produced

Should be used in every progressive shop where "cost reduction" is the slogan.

The *Red Shield* is imprinted on each Drill.

THE STANDARD TOOL CO.

CLEVELAND

New York: 94 Reade St. Chicago: 552 W. Washington Blvd.

Fredk. Pollard & Co., Ltd., London and Leicester, England Paris, France—Burton Fils Copenhagen, Denmark—Nienstaed & Co.



Speed: 20 miles an hour?

PERHAPS—with every chug and wheeze doing its bit, the two-cylinder affairs of former days sometimes did attain a twenty mile clip. But such a rate was seldom maintained. Undreamed of was the mile-a-minute pace of today.

Industrial cleaning, too, once moved at a faltering, "twenty mile" gait. The old-time, "two-cylinder" caustic tank lacked power to clean quickly and well. As a result, production dragged. Costs mounted.

What a contrast to present-day Oakite methods that keep cleaning always in step with other plant operations. Every minute is made to count. Production is accelerated. Waste effort eliminated.

How about your cleaning? Is it as efficient as it can be? A comparison with Oakite methods will soon tell you. Write for details.

Oakite Service Men, cleaning specialists, are located in the leading industrial centers of the U. S. and Canada

Oakite is manufactured only by

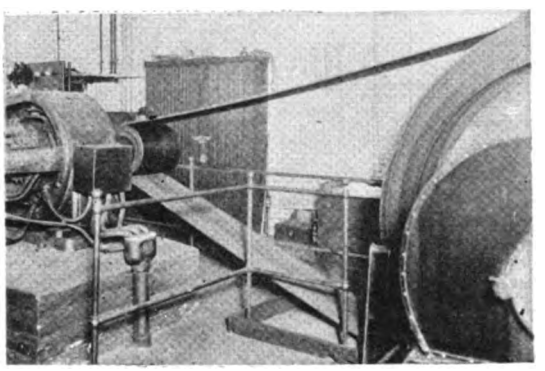
OAKITE PRODUCTS, INC., 40A Thames St., NEW YORK, N. Y.

(Formerly OAKLEY CHEMICAL CO.)

OAKITE

Industrial Cleaning Materials and Methods

TENTACULAR TRANSMISSION BELT



The speed of this Generator was increased 20% by using Tentacular

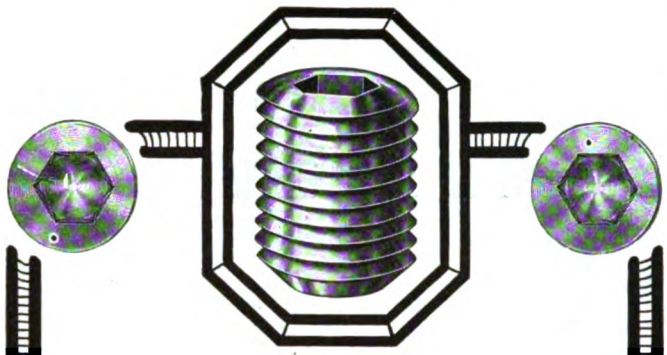
ALEXANDER BROTHERS, Inc.

Manufacturers of Leather Belting

Since 1867

14 South St., Phila., Pa.

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Playing Safe

On some machines and appliances a hollow screw holds a key position. It either *holds,* or in some vital part your machine fails.

The machine builder, then, can do either of these things about set screws: Put in "ALLENS" on his own initative; put them in at the customer's request, *or* let the customer replace with them.

It might cost more to use "ALLENS" as original equipment, than to have them used as replacements—*but for this:*

Some who neglect to replace your set screws, may in the face of mechanical troubles *replace your machines.*

The Allen Mfg. Co.

127 Sheldon St., Hartford, Conn.

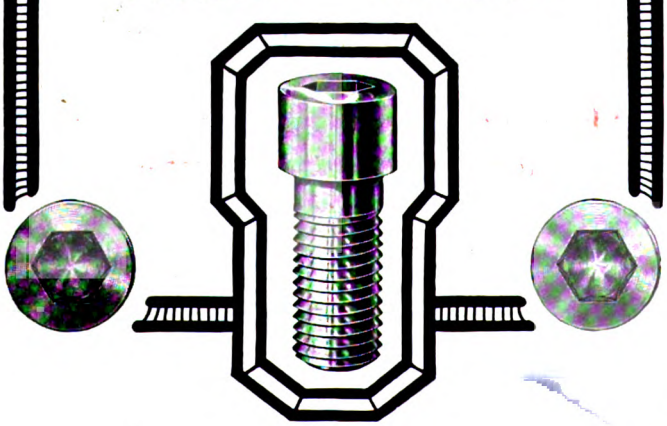
Branch Offices:

W. C. Stauble
3360 Pasadena Ave.
Detroit, Mich.

R. E. Gregory
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E. P. Crawford
3348 No. Park Ave.
Philadelphia, Pa.

W. J. McRae
320 Market Street
San Francisco, Cal.



(Continued from page 72)

less belt with perforations inside a housing and with oil circulated at 75 gal. a minutes, is provided.

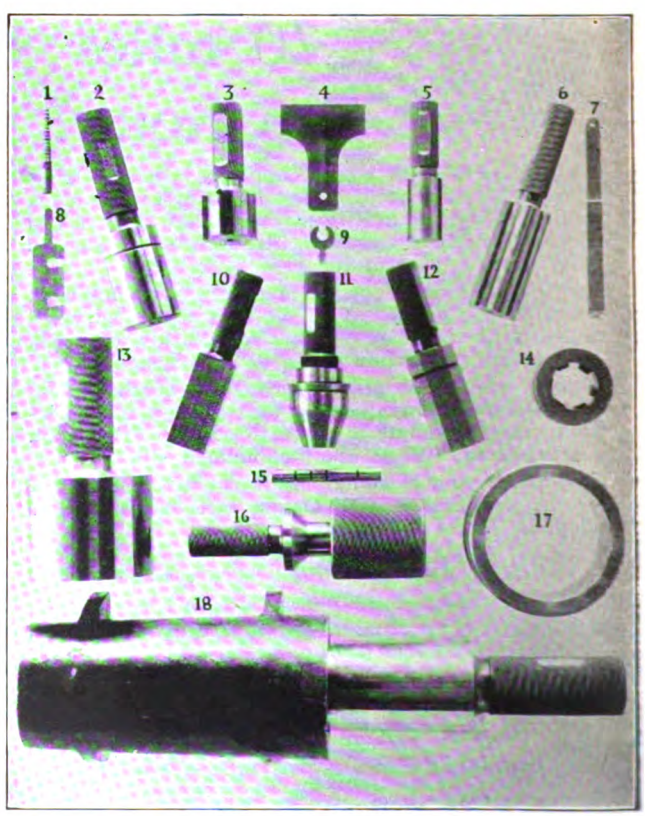
Material to be treated is loaded on trays which are carried through on rolls to the discharge and where the tray is dumped, the materials passing on to the quenching tank conveyor and the empty trays being returned by gravity and elevator conveyor.

A Set of Gauges for General Use

THE value of a good gauge equipment to the shop can be expressed in terms of dollars. The time used in testing and gauging parts, during the course of their manufacture, is reduced to a minimum; the accurate duplication of parts is assured because they are compared to an invariable standard; the use of gauges is an aid in reducing the percentage of work spoiled, both in its early stages and in its finishing. This means a saving in time, material and money.

The high accuracy which should be characteritsic of such tools, is maintained by a comparison of the gauges during the entire course of their manufacture with machines that measure to .00001 part of an inch. Temperature is also an important factor. Precautions are taken to guard against heat expansion during the measuring operations.

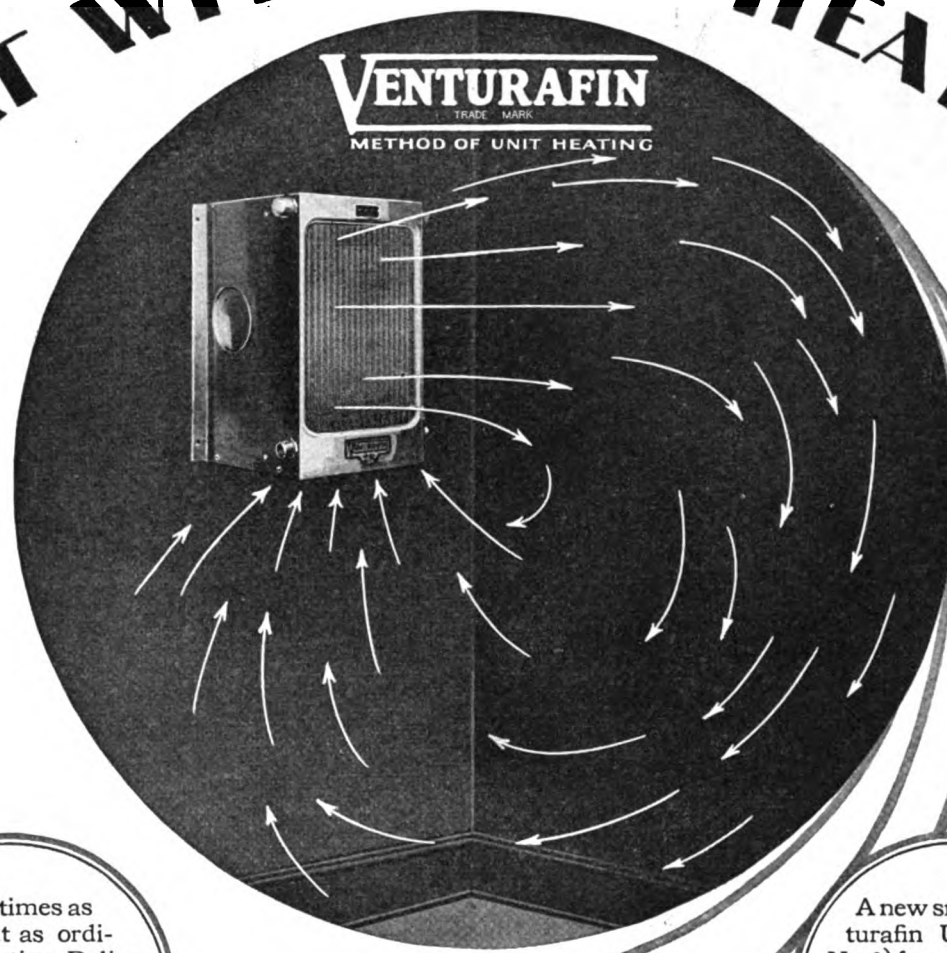
The accompanying illustration shows a set of gauges covering almost all ordinary shop uses and some special uses. It will repay study as some of them are adaptable for other purposes than those intended.



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HEAT WITH UNIT HEATERS



Five times as efficient as ordinary radiation. Delivers from 450 to 900 cubic feet of hot air per minute. Cheaper to buy, install and operate.

A new small Venturafin Unit (Size No. 2) for stores, offices, shops, garages, factories, showrooms, warehouses, depots, and countless other places.

Ventilates as it heats—gives positive heat control and more even distribution of heat in working areas — and is pleasing in appearance.

One-quarter the weight of an equivalent amount of radiators, wall coils, etc., and occupies only one-tenth the space.

Heats up in a jiffy in the morning. Reduces heat losses to a minimum. Forces heat where you want it, when you want it.

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AMERICAN BLOWER COMPANY
BRANCH OFFICES IN PRINCIPAL CITIES
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"Sirocco" TRADE MARK
VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT
Manufacturers of all Types of Air-Handling Equipment — Since 1881

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Everedy Electric Hoist
Patented and patents pending. Light weight. Steel plate construction. Every moving part accessible. Patented adjustable up and down limit stop. Adjustable to any overhead conveyance. Capacity 500 lbs. to 12,000 lbs.

"Reading" Multiple Gear Chain Hoist
Self-lubricating. All gears cut from steel blanks and operate in a bath of oil contained in an oil-tight, dust-proof casing.

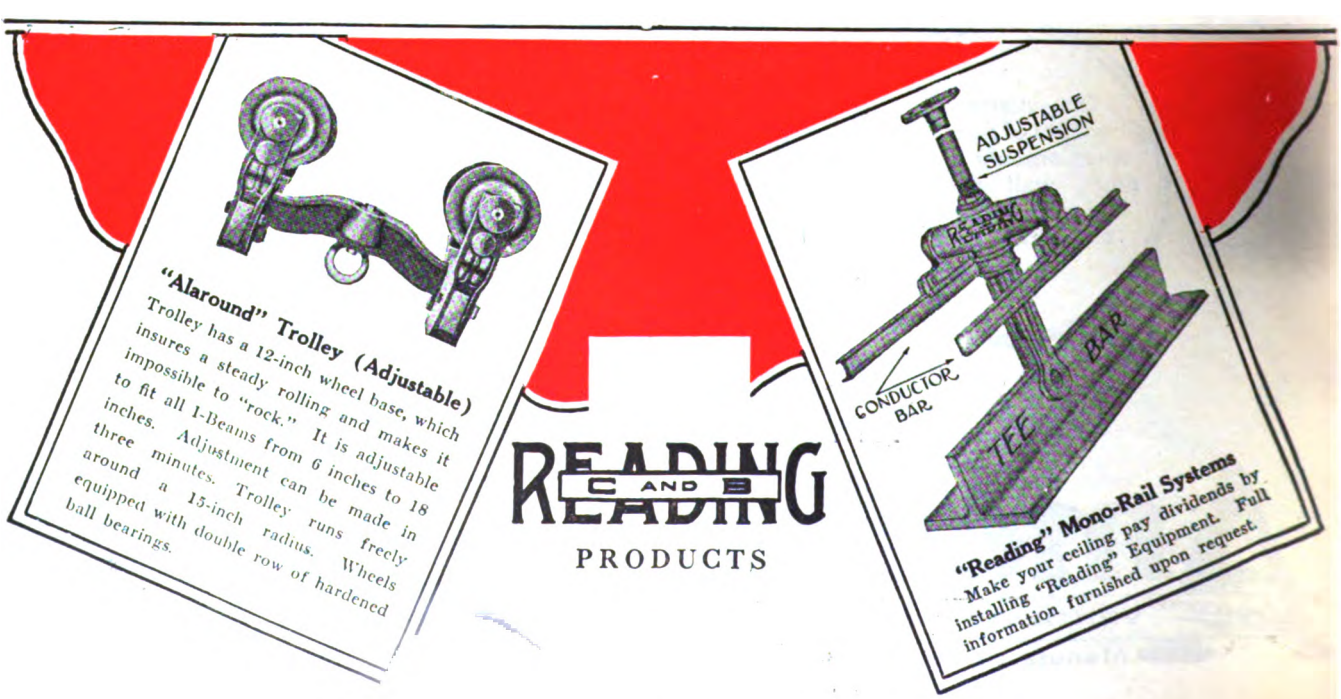
"Reading" Traveling Cranes
All steel construction. Highest grade of workmanship and material used. Cranes are built in several types and can be furnished for quick delivery.

TWENTY YEARS OF FAITHFUL SERVICE

Every product leaving our factory carries an iron-bound guarantee against defective workmanship and material. Perhaps you have some kind of a material handling problem in your plant—and it may be possible that you don't realize it exists. Solving material handling problems is our business. In order to sell any of our equipment we must show the buyer, by actual figures, that while he is paying so much for machinery, he is going to get greatly reduced handling costs. Unless we can prove to you that "READING" Equipment will honestly pay for itself out of the savings, we have nothing to sell you.

At Your Service

READING CHAIN & BLOCK CORPORATION
READING, PENNA.



"Alaround" Trolley (Adjustable)
Trolley has a 12-inch wheel base, which insures a steady rolling and makes it impossible to "rock." It is adjustable to fit all I-Beams from 6 inches to 18 inches. Adjustment can be made in three minutes. Trolley runs freely around a 15-inch radius. Wheels equipped with double row of hardened ball bearings.

"Reading" Mono-Rail Systems
Make your ceiling pay dividends by installing "Reading" Equipment. Full information furnished upon request.

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Making Giants of Men

Look at the illustration. Seems exaggerated but it isn't. The tremendous ratios designed and built into Stuebing-Cowan products make giants of men. It costs you twice as much per ton if inefficient equipment makes ton loads maximum that could be doubled with a Stuebing.

Check your costs against costs with a Stuebing—or against the reasons why Packard—Delco—Johns-Manville—American Can—reorder them again and again.

Better still order one today. A factory branch office can be reached by the telephone on your desk.

The Stuebing-Cowan Co.

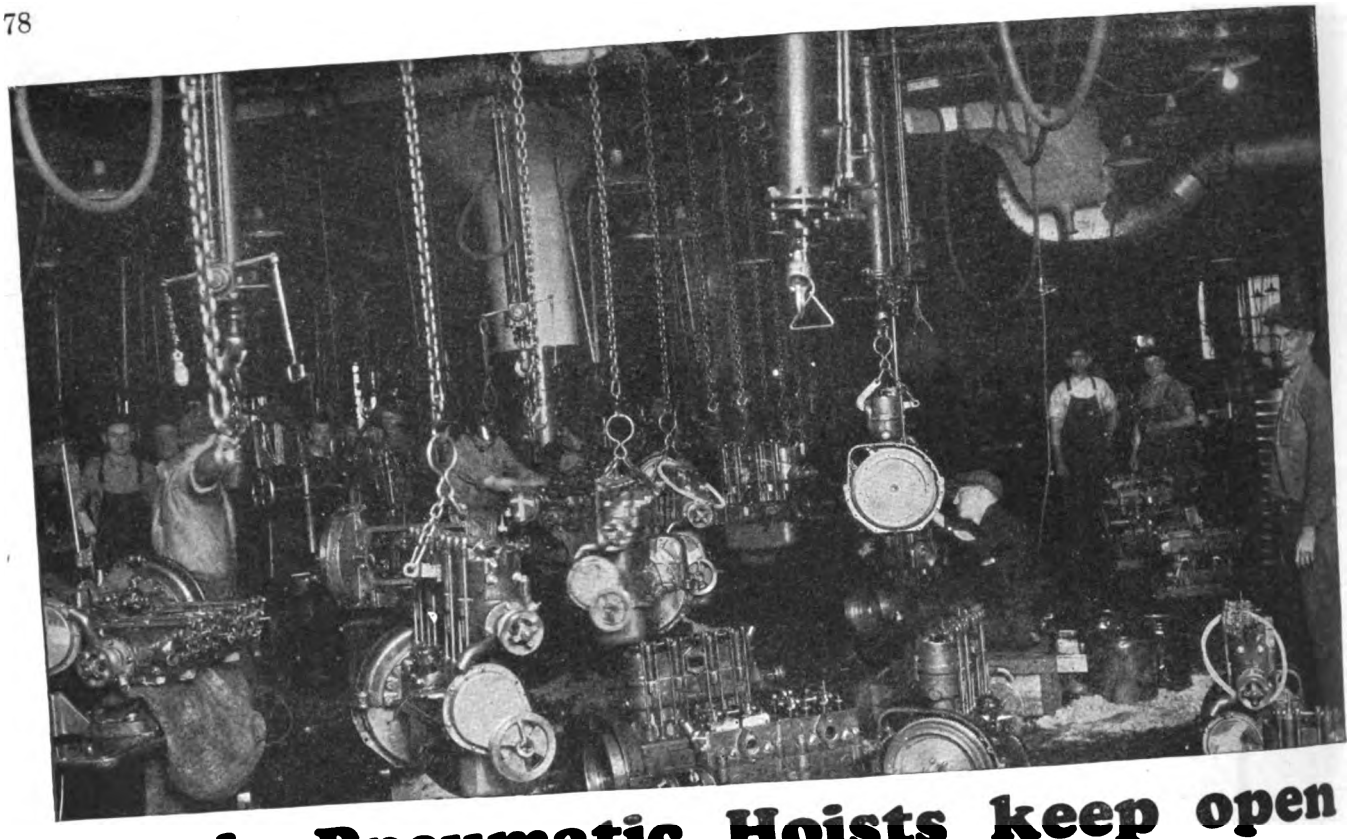
Cincinnati, Ohio Holyoke; Mass.



Stuebing Steel Bound — Patent Bound — Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble.

StueBing COWAN

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Curtis Pneumatic Hoists keep open the "bottle necks" of production in this 2400-a-day automobile plant

In the plant shown above, Curtis hoists are stationed at certain "bottle necks" of production to prevent congestion. Almost any price would have been justified for power hoists that would deliver the speed and dependability required. Yet the Curtis, selected on merit, not price, cost but little more than a totally inadequate hand chain block would have cost!

The Curtis air hoist may have a fixed position, or be mounted on a crane or trolley. It may be used vertically, horizontally or in any other position. It may be direct lift or rope compounded, mounted in an elevated position or buried in the ground.

It fits the greatest imaginable number of local conditions, and is the most generally useful of all types of hoist. May we send further information?

CHECK ITEMS IN WHICH INTERESTED

- Model "A" Air Compressors. Full self-oiling. Water cooled.
- Air Hoists, Cranes, Trolleys. Fast, economical, speed up production.
- Paint Spray Compressor. Hand unloader. (By-pass for starting.)
- Style "V" Two-Stage Compressor. Air-Cooled. ¾ to 2 H. P.
- Automatic Air Mist Car Wash System. A complete cleaning service.
- Hydraulic Car Washer. 1 H. P.; 2 H. P.; 2 H. P. oversize.
- Rotating Auto Lift. Oil-locked. Absolute control and safety.
- Air Stands. Reel type or tower type. Easy to operate.
- Air Lift. For raising one end of car. Excellent for washing underside. C3

Curtis

Pneumatic Machinery Company

St. Louis

74th Year

1951 Kienlen Ave., St. Louis 518-R Hudson Terminal, New York

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No Temporary Storage Between Receiving and Processing

By
Leon I. Thomas

Conveyors which eliminate waits in handling food products are applicable to other industries

GOODS come in by the freight-car full. They must be unloaded. True, the goods may shortly go into production, but even under practically ideal conditions there is almost sure to be a short period during which they must await their turn. This means temporary storage. And temporary storage even if only a matter of minutes almost always signifies lost motion in handling. So often places of temporary storage are regular whirlpools of goods with little or no order but with much confusion.

One notable instance where this unnecessary handling has been eliminated and where orderliness prevails is at the Chicago packing plant of the Kraft Cheese Company.

Cheeses come in by the freight-car load from the country. The cars are spotted at the receiving room door. A section of roller gravity conveyor leads right from the car door and delivers the cheeses down to the basement level.

Here they used to be picked up on two-wheeled trucks, carried to a vacant space and piled on the floor for a brief period — generally not over a half day. As fast as the cleaning and other production processes could absorb them, these cheeses were taken from the temporary storage, the containing boxes removed, and put into the washing machinery.

But this is where the present method differs. The handling into and out of storage is now practically eliminated, at least insofar as hand work is concerned. And therefore no truckers are needed at this point under the present plan.

Here is how it works: the roller gravity conveyor circles the basement (this mere circling in itself accommodates considerable storage) and terminates along one side of the basement as the accompanying illustration shows. Leaving this straight terminal stretch of conveyor, and at right angles to it, are several branch lines of gravity conveyor. In effect this is like the trackage in a railroad company's freight yard. Since several cheeses are piled on top of one another, a relatively small floor space serves to accommodate a large tonnage.

The switching from the main line to the branch tracks is manually done by a dispatcher with little muscular effort because of the insertion at the junction points of sections of ball-bearing mounted ball type of turntable.

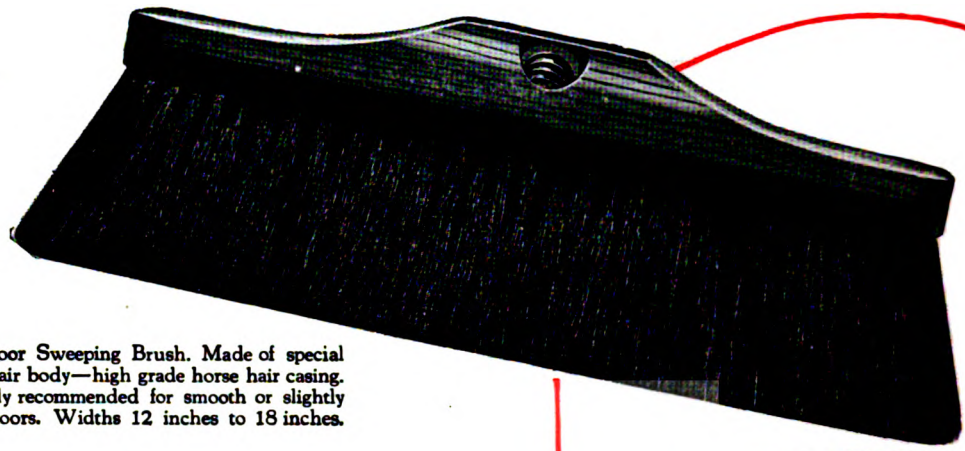
Thus the dispatcher can, if he wishes, collect differ-

(Continued on page 82)



Incoming boxes pass down the interrupted gravity conveyor from the receiving room and are transferred to the branch conveyors which lead to the first process step.

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530 Floor Sweeping Brush. Made of special mixed hair body—high grade horse hair casing. Especially recommended for smooth or slightly rough floors. Widths 12 inches to 18 inches.

Osborn Maintenance Brushes

Every Osborn Brush is made for the particular job it is intended to do—a reason for their efficiency, economy and widespread popularity.

Osborn maintains a standard of quality in materials and workmanship that varies only in the direction of longer wear and greater usefulness.

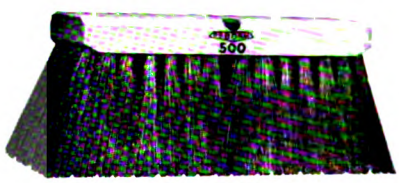
The brushes here illustrated are only a few of the wide variety that Osborn offers for use in mills, factories, municipalities and railroad shops and yards.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Ave. Cleveland, Ohio

Branch Offices
New York Detroit Chicago
San Francisco Los Angeles



641 Heavy Duty Floor Brush. Made of select Palmyra fibre—staple set. Large flare on sides and ends makes sweeping faster. Widths 14 inches to 30 inches.



500 Push Broom. Made of genuine African Bass. Length of fibre 6 inches. Size of block 16 inches x 3½ inches — Sweep of broom 22½ inches.



422 Counter or Bench Duster. Made of mixed gray hair—staple set. Length of hair 2⅞ inches—overall length of brush 9 inches.



656 Counter or Bench Duster. Made of pure black horse hair—staple set. Length of hair 2¼ inches—overall length 9 inches.

69 Whisk. Strongly made of selected bassine fibre. An excellent general purpose whisk widely used by machinists.



Osborn Brushes

A BETTER WEARING BRUSH FOR EVERY USE

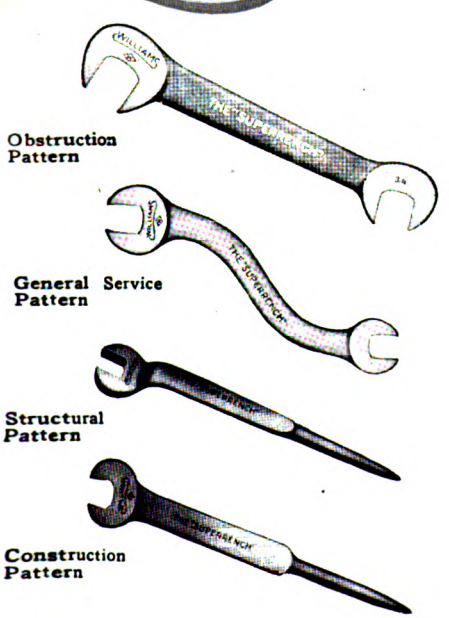
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Strong as a 6 ton girder *light as a 6 ounce bolt*



Engineers Pattern



Obstruction Pattern

General Service Pattern

Structural Pattern

Construction Pattern

MADE doubly serviceable through tremendous strength combined with extreme lightness — that's The "SUPERRENCH."

Any job that any wrench can do can be done with a "SUPERRENCH" quicker, better and more conveniently. Thin heads and narrow, pointed jaws "get in" and grip where others fail. "SUPERRENCHES" stand up where others break.

Examine the new rustproof Chrome-finish. Give The "SUPERRENCH" a trial on the hardest job you know of. Cramped quarters won't hinder it. Frozen nuts won't break it. It's absolutely dependable.

Every "SUPERRENCH" is Guaranteed Against Breakage

J. H. WILLIAMS & CO.

"The Wrench People"

New York BUFFALO Chicago

WILLIAMS

SUPERIOR DROP-FORGED TOOLS

"SUPERRENCH"

(Chrome-Molybdenum)

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The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street

POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



"Of Course They'll Save You Time and Money!"

EVERY user of POWELL Platforms and other pressed steel Material Handling Equipment joins in this enthusiastic praise. Wide flexibility of this line makes it apply to every handling problem, making a record for both service and economy. They carry tons and save minutes in plants of every size—why not investigate the POWELL line right now? We will gladly send you full details and prices.

The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb ...ngstown

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(Continued from page 79)

ent grades of cheeses on the different branches.

From this point on, the method of taking off the boxes and putting the cheeses through the washing process is as before. But there is practically no lifting or no trucking whatsoever.

"Live storage," as applied in public automobile garages, might well have been coined expressly for a system like this where all the stock (about 250,000 pounds of it daily, on the average) is constantly on rollers from the time it leaves the incoming freight car till it goes into processing operations.

A Tractor Car Puller

A FIVE ton "Caterpillar" tractor renders valuable service (in addition to its regular work) at the plant of the Union Rock Company in pulling loaded and empty cars ofter handling as many as four cars at a



time, the combined weight of rock and cars being 310 tons. The accompanying photo shows the "Caterpillar" pulling two loaded cars each of which holds about fifty tons of material.

A Low-clearance Short-radius Industrial Tractor

THE new tractor illustrated is intended for use in factories, railroad shops, freight terminals, oil fields, lumber yards, road building and maintenance work, parks, logging camps and similar use.

Because much of the work of such a tractor is in close quarters, this machine has been built to be compact and low. It can go through gates and doorways, up ramps, on elevators and all manner of tight places where it would be impossible for a larger machine to go. It has great stability because of its low center of gravity. It works on steep slopes and can go under low overhanging obstructions because there are no parts projecting up over the tractor. It can turn completely in a radius of ten feet, a remarkably short turning radius.

It is rated at 12 hp. on the drawbar and 20 hp. on the belt, with surplus power for emergencies. Equipped as it is with a belt pulley, it is always ready for a belt job as well as a drawbar task. A quick-acting, throttling governor regulates the speed of the engine quickly to meet any variations in load.

Due to the fact that so much of the work of the Industrial Tractor is on floors of buildings, platforms, decks, docks, ramps and pavements, this tractor obtains

(Continued on page 86)

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"a simple twist of the wrist"

SPRAGUE ROD CONTROL *for* FOUNDRIES



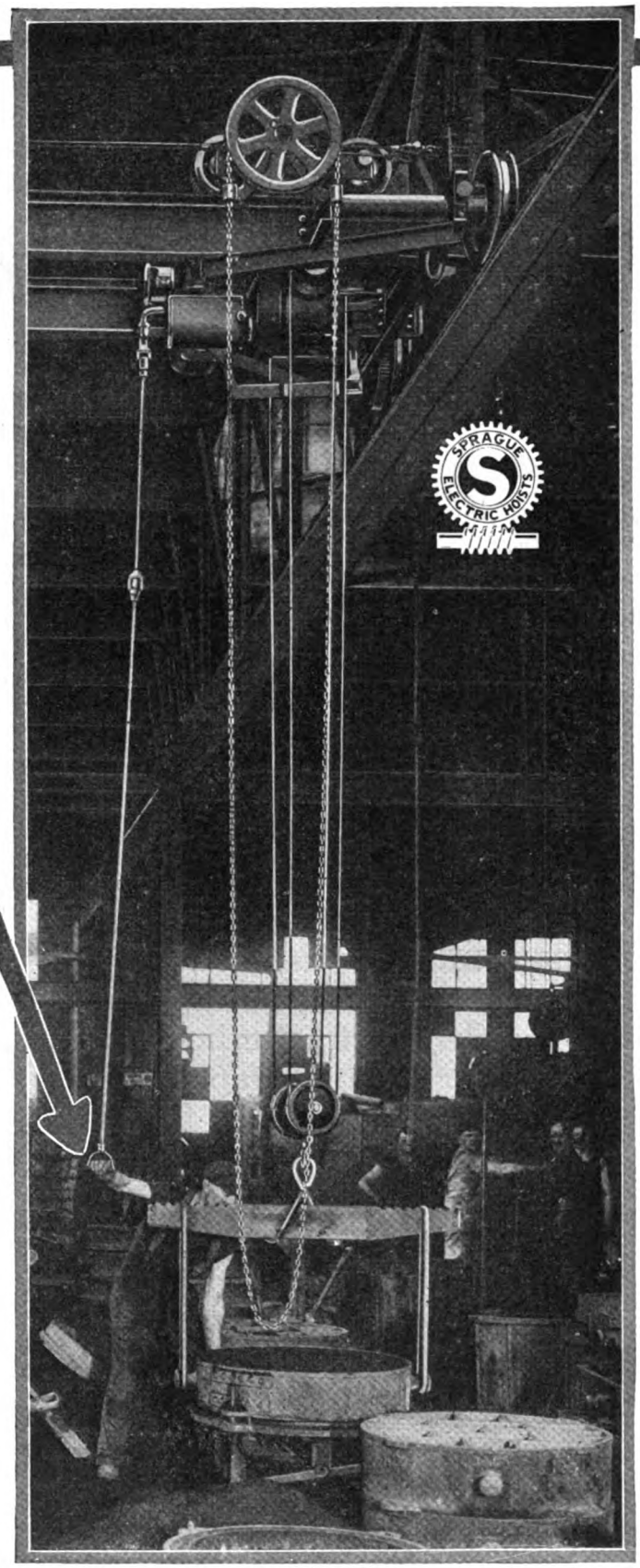
A twist for "up", a twist for "down"—all done by one hand, allowing the operator a free hand to guide his load.

Furthermore, both hands can be free, for the hoist will run at any speed until controller is turned off or turned to next speed. Oversize motors allow lifting of full load at any speed.

This exclusive Sprague feature provides an ideal hoist arrangement that saves time and provides precision in drawing patterns, lowering copes, and handling flasks. Hoists of this type are supplied in capacities of ½ ton to 6 tons for direct current only.

Sprague Electric Hoists have worm drive, automatic lubrication, are simple in construction, thoroughly enclosed and of a design that has proved eminently successful for over 20 years.

A bulletin descriptive of the Sprague line, we shall gladly send on request.



SPRAGUE ELECTRIC HOISTS

DIVISION OF

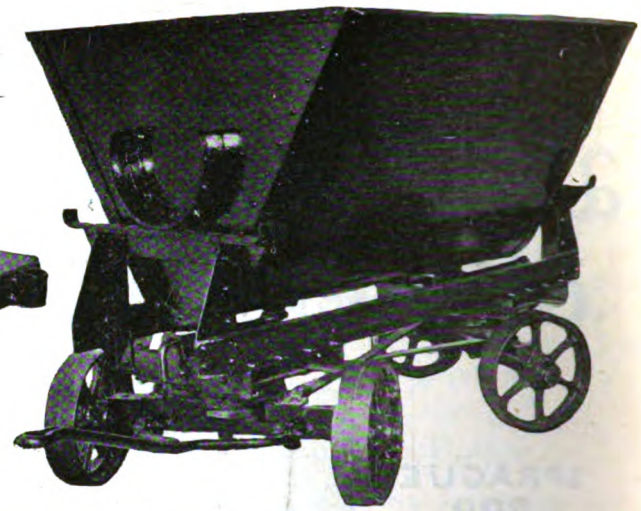
SHEPARD ELECTRIC CRANE & HOIST CO.

30 CHURCH ST. NEW YORK, N.Y.

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The U. S. Metallic Packing Company, Philadelphia, Pa., employs Hyatt Roller Bearings in its trucks to guard against bearing breakdowns, replacements and expensive time losses.



STRENGTH
at the bearing points

THE life of a truck is determined by its bearings. With rubbing plain bearings wear is accelerated, friction holds sway, power is wasted, replacements many, and the truck is racked prematurely to the scrap heap.

Hyatt Roller Bearings, in contrast, keep your trucks young permanently—no matter how severe the service. The rugged rollers turn with the load in a natural, easy motion. They practically eliminate friction and wear, saving power and replacements. Lubrication months apart is ample.

Wherever materials must be handled quickly and economically users of Hyatt equipped trucks and trailers are profiting by Hyatt efficiency. Why not follow their example and insure continuous operation and economy by specifying Hyatt Roller Bearings?

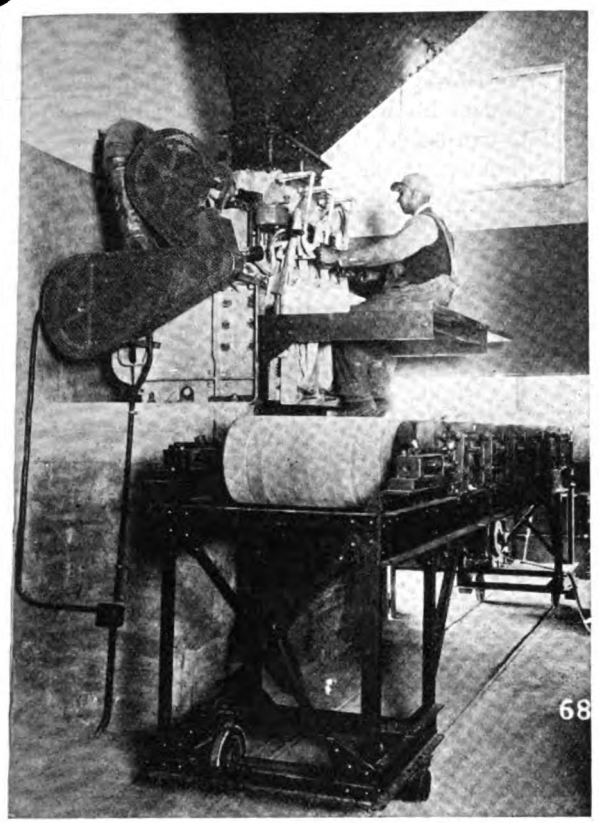
HYATT ROLLER BEARING COMPANY

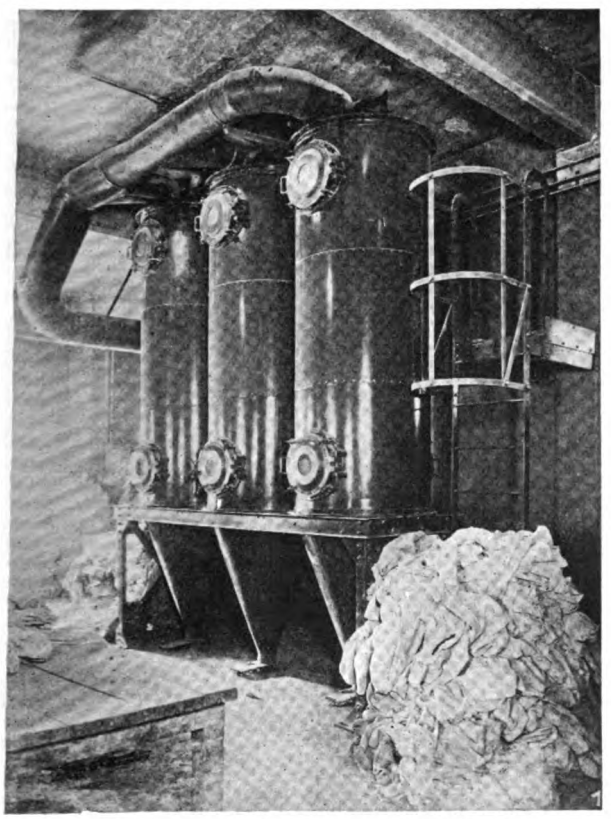
Newark	Detroit	Chicago	Pittsburgh
Worcester	Philadelphia	Oakland	Cleveland

HYATT
ROLLER BEARINGS
PRODUCT OF GENERAL MOTORS

For produ... ...d in this issue write Industry Illustrated

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Upper—Dust Collector on Packing Machine.
Lower—Dust Collector on Sack Cleaners.

Turning dust in the air into a profitable product

DRACCO Does It

Here are two striking examples of modern dust collecting practice in a cement mill.

In this installation the Dracco Filters collect the floating dust and deposit it in the conveyors. This not only saves the product but keeps the room free from disagreeable dirt and dust.

One Dracco Three Compartment Unit handles both the bag packing Machine and the sack cleaning equipment.

Hundreds of plants in all branches of industry are finding definite savings can be accomplished by the adoption of Dracco. We will be pleased to demonstrate the ability of Dracco in your plant.

Write for details or ask for an appointment with one of our engineers.

Dust Recovering and Conveying Co.

Cleveland, Ohio

DRACCO DOES IT

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The GAMMONS helical taper pin REAMER

Reams holes in any metal three times as fast as a Fluted Reamer

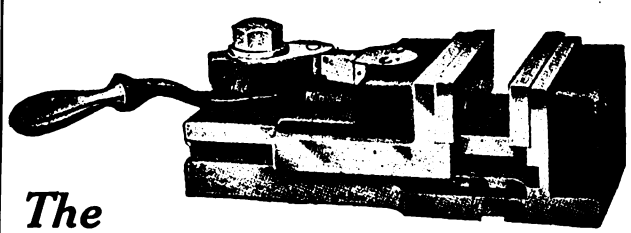
Here's a Taper Pin Reamer that can be used in drill press—electrical or air drill.

It will ream holes in metal three times as fast as a fluted reamer. It is carefully tempered—accurately ground and may be run at any reasonable speed with one-tenth the breakage of the best fluted reamer made.

Write for illustrated booklet

The Gammons-Holman Co.
405 Main Street Manchester, Conn.

Wherever a Quantity Must be Quickly Handled



The "PRONTO"

Quick Operating and Wide Opening Lever Vises

Made in Three Sizes

No. 1—6¾" long—8 lbs....$50.00.
No. 1½—8¾" long—17 lbs..$60.00
No. 2—9¾" long—33 lbs....$70.00

Prices Subject to a Discount of 45%

A slight movement of the lever and the jaws close with a grip of steel. This is just what you need where a great many pieces must be handled and handled quickly.

Designed for Milling and Drilling Machines

"PRONTO" Quick Operating and Wide Opening Lever Vises are made in the sizes shown. Write for descriptive circulars.

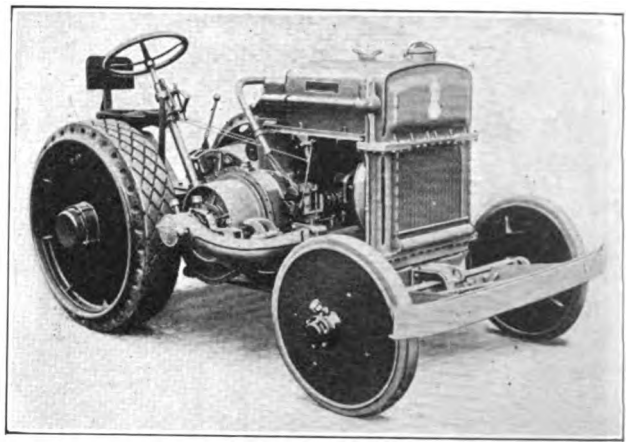
Manufactured by

EDW. PURVIS & SON
Successors to Carter & Hakes
110 YORK STREET BRO[illegible]N. N. Y.

(Continued from page 82)

the traction by weight on the rubber tired wheels. They have good traction on slippery or loose surfaces.

The weight of the tractor is so divided that approximately two-thirds of it is borne by the rear wheels. These are cast hollow so that if needed in very hard going they can be filled with 400 to 500 pounds of sand for additional traction.

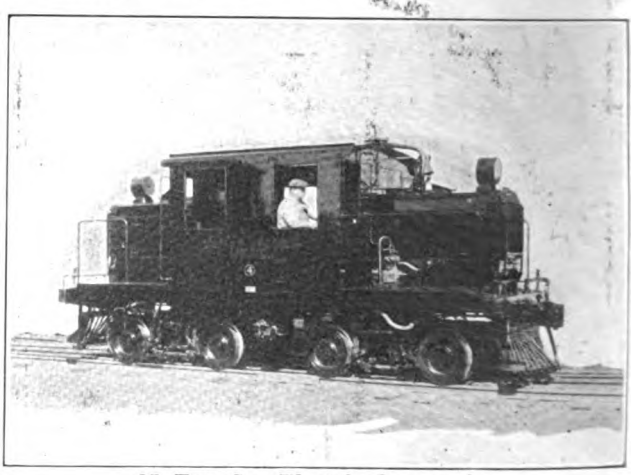


One of the features of the tractor, we are informed, is that it is so simple that anyone with ordinary ability can operate it successfully. Any adjustment that is necessary is easily understood and easily made. All necessary controls are within easy reach of the driver.

The steering gear moves the front wheels quickly without allowing them to jerk out of control.

Gas-Electric Locomotive Bought By City of Winnipeg

A NEW TYPE of double-truck gas-electric locomotives has just been shipped to Winnipeg, Canada, for use by the municipal hydro-electric system. The equipment of the locomotive is the most modern,



25 Ton Gas-Electric Locomotive

such as shutters on radiators, for extreme weather conditions, snow plow, special arrangement of cab, with its lighting, ventilating and hot water heating systems. air sanders, straight and automatic air brakes, power take-off for direct current up to 240 volts, for lighting. heating, cooking, operating electric motors, windlass. pumps, etc. This locomotive has been built to maintain a schedule of 25 miles per hour over heavy grades and

(Continued on page 88)

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Speed Changes of 750 to 8000 Revolutions per ½ minute Controlled by LEWELLEN

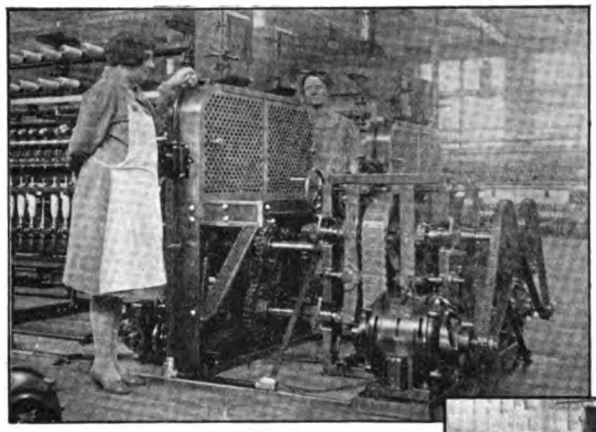
Variable Speed Transmission

In a large New England Worsted Mill, 20 LEWELLEN Transmissions are providing the correct speeds for the production of various worsted specialties.

Because speeds can be controlled and changed as desired, a wide range of yarns can be produced. In this installation, the decrease in friction load has been estimated at 40%. Belts, idlers, and tighteners have been eliminated.

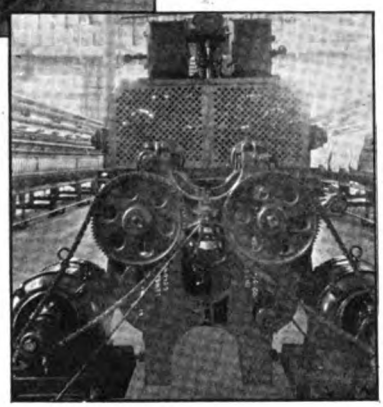
In the textile industry, LEWELLEN Transmissions are used on tenters, dryers, washers, mercerizing machines, throwing frames, winders, etc.

Write for the LEWELLEN Catalog which shows how they can apply to your industry.



Twenty LEWELLEN Transmissions on twister frames, controlling a wide variety of speeds.

Method of mounting LEWELLEN Transmissions—no belts, idlers, or fasteners needed.

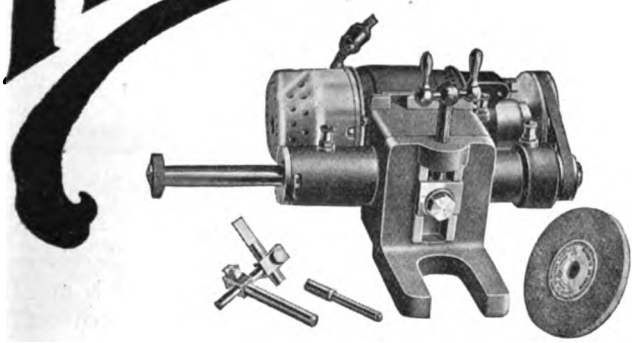


There are thousands of applications of LEWELLEN Variable Speed Transmissions. Every manufacturing process needs this flexible speed control.

LEWELLEN *Variable Speed* **TRANSMISSION**

LEWELLEN MFG. CO., 1300—10th STREET, COLUMBUS, IND.

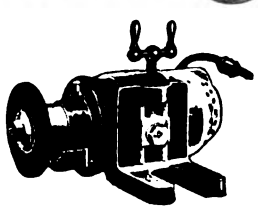
"Hisey"



Upper photograph shows the combination grinder assembled for internal grinding.

The grinder at right has extension removed and angle plate fitted direct to housing for external grinding.

Made in ¼, ⅓ and 1 H.P. sizes.



Combination Internal and External Lathe Grinders

Give Tool Room Accurcay with wide range adaptability

The unit construction feature of this combination grinder is unique. It is a precision grinder for both internal and external work, its accuracy being indefinitely maintained no matter how often interchanged.

A velvet finish can be obtained on any internal or external work.

For the Tool Room the smaller size is invaluable, while the larger sizes are adaptable for grinding engine cylinders, discs, journals and all classes of roll and surface work.

Write for Catalog 35-I

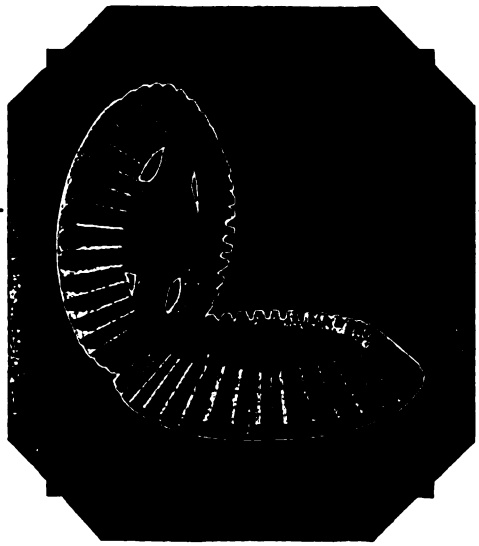
The Hisey-Wolf Machine Co., Cincinnati, O.

Manufacturers of

Electric Drills—Grinders—Buffers

Since 1896

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MEDART
GEARS

If you need gears—QUICK—call on Medart, St. Louis. Gear headquarters! Medart Gears are furnished in practically every type, material, construction and size:—Spur, Spiral, Bevel, Miter, Internal, Herring-Bone, Worm, Mortise (including wood cogs) — Pattern Molded, Machine Molded, or CUT-TOOTH—Cast Iron, Cast Steel, Semi-steel, Bronze and composition Fabroil, Textolite and Textoil.

Patterns unusually complete. "Right-now" special stock shipments or "special-rush-special-order" shipments.

NOTE:—Fabroil, Textolite and Textoil composition materials made by General Electric Company converted by gear-cutting into finished Gears by The Medart Company—national distributors.

Get Medart Catalog No. 43 and discount sheet—for Everything in Line Shafting Equipment and Bulletin on Timken Equipped Line of Industrial Applications.

THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
Office and warehouse in Cincinnati
Manufacturers of Power Transmitting and Kindred Machinery

MEDART
Everything in Line Shafting Equipment

For products this issue write Industry Illustrated

(Continued from page 86)

at temperatures varying from 47 degrees Fahrenheit below zero to 110 degrees above.

The City of Winnipeg Hydro Electric System is a municipally owned company which supplies electrical power direct to the city of Winnipeg and furnishes wholesale power to all portions of the Province of Manitoba.

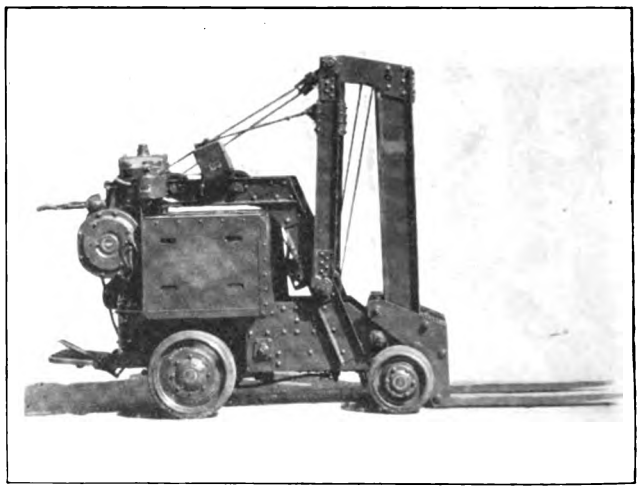
"We expect to do with this locomotive most of the work that we have been doing with a 75-ton Steam locomotive, keeping the large steam locomotive in reserve for any excessive hauling operations," Mr. Wylde said.

The Gas-Electric Locomotive will be used for freight and passenger service from the end of the Canadian Pacific railroad at Lac du Bonnet through a dense forest for 25½ miles to the power plant on the Winnipeg river, known as Point du Bois. All material and supplies will be hauled in by means of the Gas-Electric locomotive and the only passenger service in this 25-mile region will be furnished by the same agency.

An Ingenious Truck for Moving Sheets

THE accompanying illustration shows a new type of tinplate truck. This truck has a capacity of five thousand pounds of sheets and is so compact that it may be driven inside the average box car.

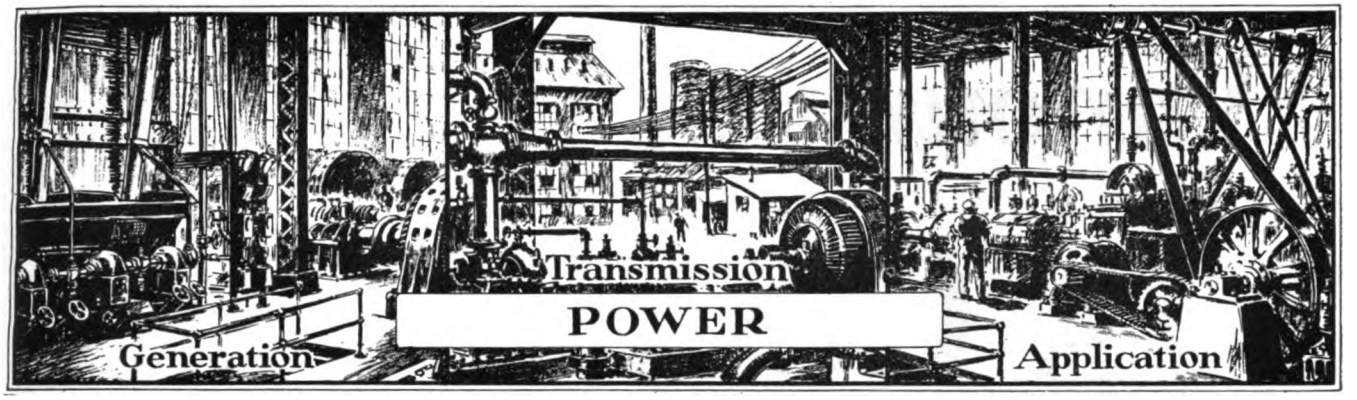
The driving axle is of the full floating type with 17½ to 1 worm gear reduction. The series type driving motor is mounted on a cradle which is cast integrally with the axle housing, thereby insuring perfect alignment between the motor, worm, and worm wheel. In



order to provide easy steering, the knuckle pivots are in line with the tire centers. Trailing axle is machined from forged alloy steel and the wheels turn on individual knuckles with the pivots also in line with the tire centers.

The hoist consists of two drums either of which may be driven by a series wound motor. A selector switch operates a set of magnetic clutches and determines which drum will be driven when the power is applied. One cable hoists the carriage and forks while the other tilts the super-structure. When picking up a load, the super-structure is normally vertical and the forks will lift high enough to stack loads one upon the other. The super-structure may be tilted a little forward of the vertical position in order to bring the points of the fork prongs into contact with the floor.

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Some Useful and Practical Power Tips

By
W. F. Schaphorst

NOT long ago I asked one of the most capable firemen I ever knew how he managed to fire overloaded boilers so easily. He could make grates burn more coal than other firemen, and was successful where others had failed.

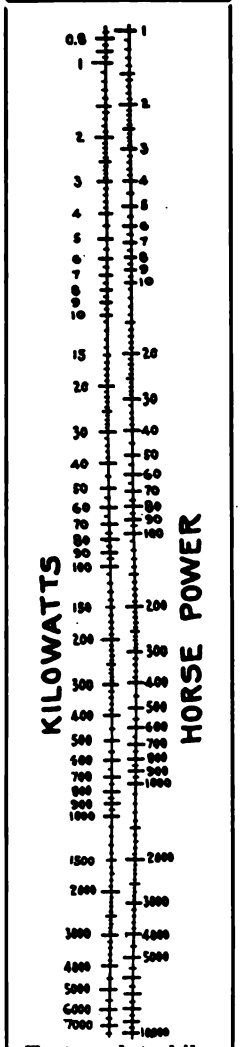
"It's easy enough when you know how," he replied. Opening the door of a boiler he was then firing and pointing at the fire he said, "This boiler is overloaded about 50 per cent. now. See how thin that fire is? The greater the load the thinner the fire, that's my rule, and it's a good one. To burn a lot of coal you need a lot of air, and the only way you can get a lot of air through the fuel bed is to keep the fire thin. When the load is less that at present, I make the bed thicker. That's all there is to it."

Few of us think of what really happens when we "open the damper" in the stovepipe or over the power boiler. We simply furnish more oxygen. But of course if the stove or boiler is so thickly laden with coal and ashes that more air cannot get through there will be no improvement in the fire because there will be no increase in oxygen. Without more air there cannot be more oxygen.

The blacksmith's forge is an excellent example. When the blacksmith isn't pumping air, the fire smoulders. But when he pumps air a temperature sufficient to melt wrought iron is produced. Very likely the amount of air pumped is considerably more than enough for perfect combustion, but what the smith wants is a "welding temperature," regardless of efficiency.

Handy Kilowatt Horsepower Scale

This scale instantly gives the kilowatts in any number of horsepower. Or, it will give the horsepower in any number of kilowatts.



To translate kilowatts to horsepower or conversely, lay a rule across this scale at the proper figure and read directly in the other column.

It is complete from 1 to 10,000 horsepower, within which range most power plants are included.

For example, how many horsepower in 1,000 kilowatts? Just glance from the 1000 on the kilowatt side to the horsepower side, and there's the answer—1350 horsepower.

Or, how many kilowatts in 1,000 horsepower? Glance across in the opposite direction and there's the answer again—750 kilowatts.

Of course the exact answer is 745.65 kilowatts, but for most ordinary and practical purposes 750 will do very well.

It would be difficult to make a chart more compact than this and yet include such a wide range of power. A chart could be made more accurate, no doubt, but that would require much painstaking work and in the end this chart would very likely prove to be just as useful for ordinary purposes.

Belt Transmission in Watts

A simple belt transmission rule that does not seem to be well known is this: "A single belt running one foot per minute will safely transmit one watt of electrical energy per inch of width of belt."

Thus, if a single leather belt one inch wide runs 5000 ft. per min., it will transmit 5000 watts, or 5 kilowatts. If the belt is 10 inches wide it will transmit 50,000 watts, or 50 kilowatts, at the same speed of 5,000 ft. per minute.

Should it be desired to convert the kilowatts into horsepower, use the scale above. For light double leather belts add 25 per cent. For heavy double leather belts add 60 per cent.

(See page 92)

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Announcing - -

A CONSOLIDATION *of* INDUSTRIA

"Factory," heretofore published by the A. W. Shaw Company, and "Industrial Management," recently acquired by the McGraw-Hill Publishing Company, will appear in January as one publication under the name of *"Factory and Industrial Management."*

"Industrial Engineering," heretofore published by the McGraw-Hill Publishing Company, and "Industry Illustrated" recently acquired, will appear in December as one publication under the name *"Industrial Engineering with which is consolidated Industry Illustrated."*

* * * * * *

These two publications will be published by a new organization known as the McGraw-Shaw Company, which is a subsidiary of the McGraw-Hill Publishing Company and the A. W. Shaw Company. This is not a merger of the parent publishing companies but strictly a consolidation of these four industrial publications by the McGraw-Shaw Company.

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PUBLICATIONS

Present Publication and Publisher	New Publication	New Publisher
Factory A. W. Shaw Company *Industrial Management* McGraw-Hill Publishing Company	*Factory and Industrial Management*	McGraw-Shaw Company
Industrial Engineering McGraw-Hill Publishing Company *Industry Illustrated* McGraw-Hill Publishing Company	*Industrial Engineering* with which is consolidated *Industry Illustrated*	McGraw-Shaw Company

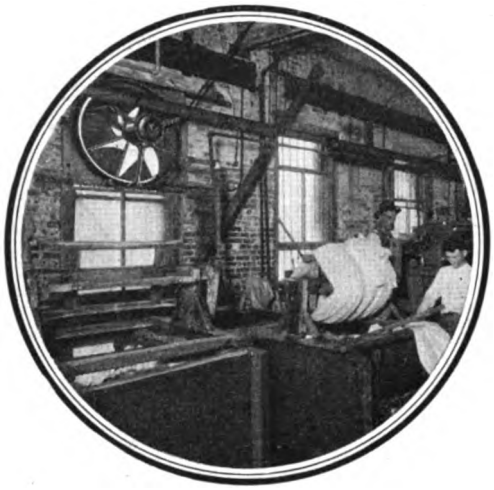
This is a consolidation of the above publications and not a merger of publishing companies.

Advertisers and advertising agents who have advertising contracts with *Factory, Industrial Engineering, Industrial Management* and *Industry Illustrated* will shortly receive complete details from McGraw-Shaw representatives.

McGRAW-HILL PUBLISHING COMPANY, INC.
New York

A. W. SHAW COMPANY
Chicago

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DIEHL EXHAUST FANS

Dye houses, laundries, etc., use DIEHL quiet running exhaust fans to remove the steam and heated air prevalent when operating. DIEHL Exhaust Fans give constant, dependable ventilation.
Send for descriptive bulletins—now.

DIEHL MANUFACTURING CO.
Elizabethport, N. J.
Atlanta Boston Chicago New York Philadelphia

DIEHL

ESTABLISHED 1888

Reversible Ratchet Wrenches
LOWELL



Two Rugged Patterns for Heavy Duty Service

No. 12345
(To the Right)

Handle 4 ft. to 6 ft. as desired. Sizes of openings in gears, 1½ in., 1⅝ in., 1¾ in., 1⅞ in., 2 in., 2¼ in., 2⅜ in., 2½ in. sq. Weight 50 lbs.

No. 123456
(To the Left)

Handle 3 ft. to 5 ft. as desired. Sizes of openings in gears 1⅛ in., 1¼ in., 1⅜ in., 1½ in., 1⅝ in., 1¾ in. sq. Weight 30 lbs.



LOWELL
WRENCH CO.
54 Commercial St.
WORCESTER, MASS., U. S. A.

ASK YOUR HARDWARE DEALER OR WRITE FOR CATALOG

(Continued from page 89)

Pulverized Coal Systems in Small Power Plants

By Russell H. Bowen

Chief Engineer, The American Pulley Company

THE fact that the use of pulverized coal, properly burned under steam boilers, is one of the most economical methods for the use of this fuel has already been so conclusively proved and so generally accepted that this article will not emphasize that point. The matter here presented relates not to the general subject of the economy of the method, but to the question as

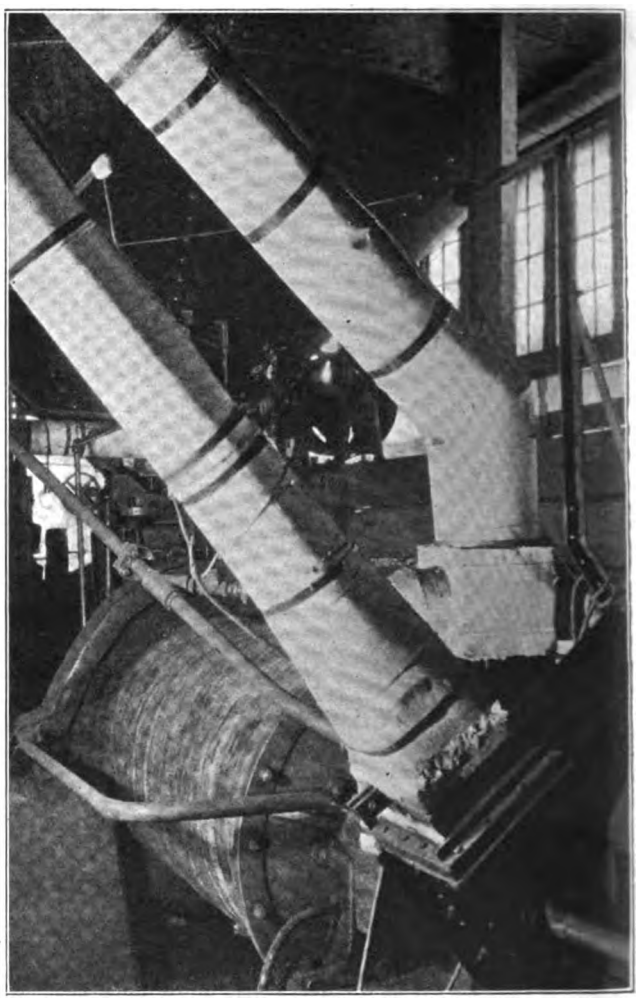


Fig. 1. The pulverizing mill with inlet pipe and conductor for pulverized fuel.

to whether this method may be satisfactorily applied to the needs of moderate size industrial plants.

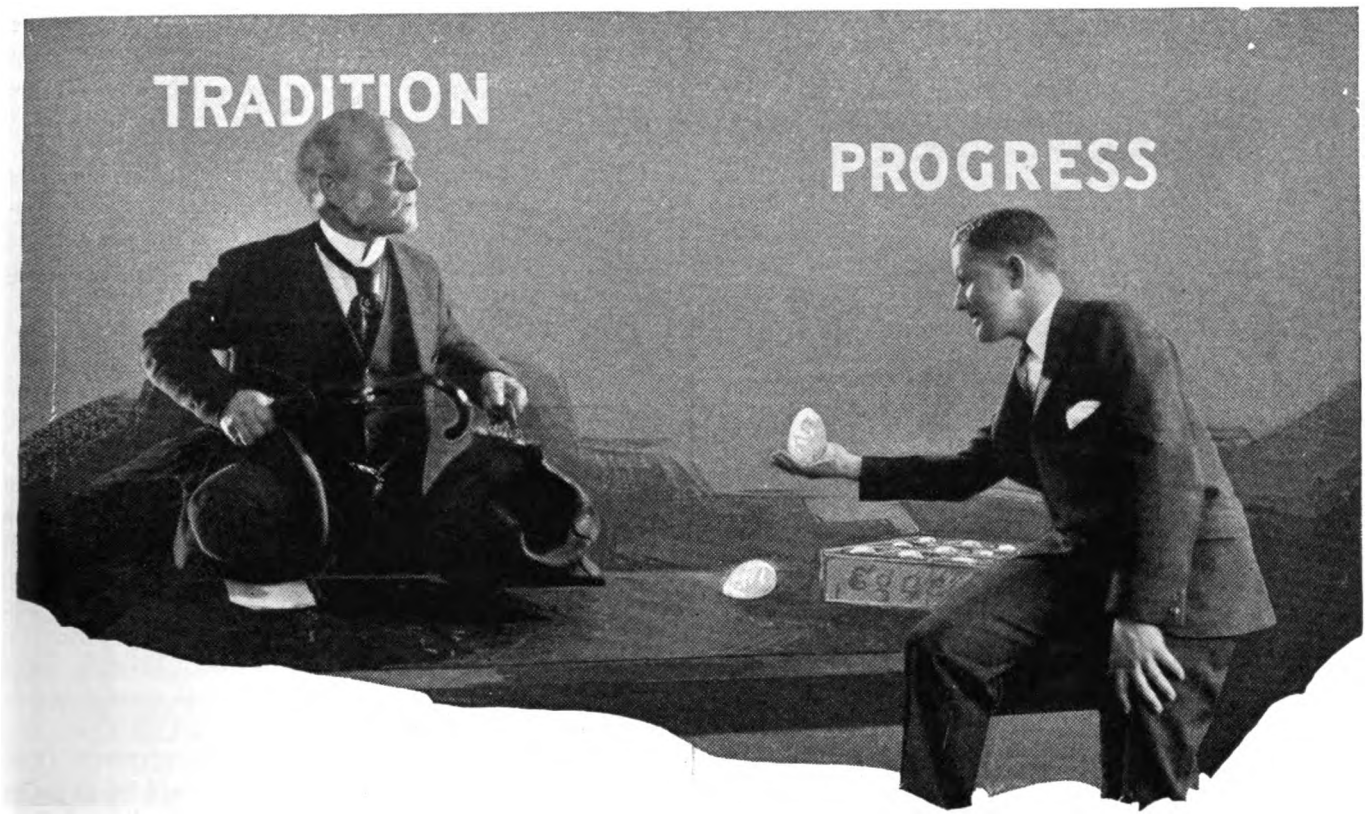
The majority of plants using pulverized coal are of sizes above the boiler requirements of the average manufacturer. This condition is perhaps to some extent due to the fact that in these smaller plants the operation of the boiler room represents but a small percentage of the total cost of the goods or articles manufactured and it is therefore not often considered worth while to spend a considerable sum of money

(Continued on page 94)

For pro... this issue write Industry Illustrated

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All motors look alike to Pop



"Here, Lad—

I've tried to be fair about turning down your recommendation that we buy "Linc-Weld" motors.

I've gone to different men in the plant and showed them how this "Linc-Weld" motor is made and they don't seem to see anything different than in other motors."

"No, Pop—

and in the same way here are two eggs from two different hens. They look alike but put them to hatch and see the difference.

The big difference between a "Linc-Weld" and one of your "Big Production motors" shows up after it gets to work.

The "Linc-Weld" is constructed for the service on which it is to be used and it's a bear cat when it has a production emergency on hand and production is the governing factor of today's cost.

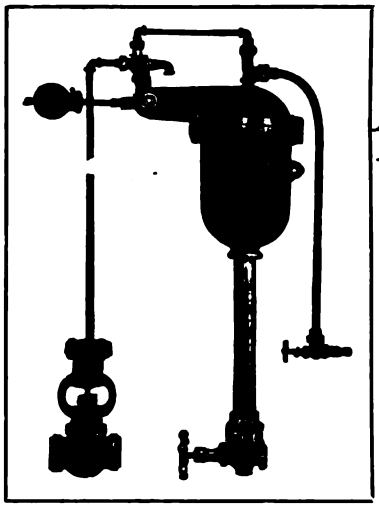
You know, Pop, a pole cat and a bear cat belong to the same family but in an emergency the bear cat digs and makes things hustle while the pole cat stops the parade."

The Lincoln Electric Co., Dept. No. 18-11, Cleveland, Ohio

M-2

"Linc-Weld" LINCOLN MOTOR

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Efficiency

Real boiler efficiency is never attained through hand feeding. A fluctuating water level is wasteful of fuel.

VIGILANT
Feed Water
REGULATORS

will put your boilers on an efficient basis. A constant water level means increased steam production, real fuel economy, less boiler strain, and safety.

Try a Vigilant—or ask the opinion of those who use them. Catalogue sent on request.

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh, Pa.



(Continued from page 92)

reducing boiler room expense.

In large power houses, however, such as electric light generating stations, etc., where the coal bill is the main item of manufacturing cost, pulverized coal equipment has been installed and operated at a saving which well justifies its use.

But there are a great number of manufacturing plants and even heating and electric generating plants of moderate size whose operators may be wondering whether coal pulverizing would mean a saving to them and who are uncertain what to do. We have no idea of advising them, but as a matter of interest will tell something of our own experience.

In using the term "moderate size" in the foregoing paragraph the writer refers to plants requiring from two hundred to one thousand horsepower boiler. The pulverizing equipment at the plant of The American Pulley Company in Philadelphia is installed under a 300 hp. Edge Moor unit, and, so far as we know, this company has been something of a pioneer in the burning of pulverized coal in a small way in this neighborhood.

The boiler room is required to generate steam for heating one and two-story buildings covering about seven acres, and in addition for use in certain manufacturing processes. The original boilers were equipped with automatic stokers, hand fed to a magazine. These stokers gave as much satisfaction as could be expected considering the time they had been in service and the conditions of load variations with which they were confronted. They were not, however, altogether efficient. At times they fell down under overload and were somewhat expensive to maintain.

After a careful investigation of a large number of pulverizing systems, it was decided to install a unit, air swept, low speed pulverizer as shown in a general way by the illustrations.

This system consists of a convenient size hopper or storage bin from which the coal passes by gravity onto a disc feeder with a regulating device and then into a pulverizing mill. The coal is carried to the top of the hopper by a conveyor.

The mill in this case is a specially designed tumbling barrel 3 ft. in diam. and 6 ft. long, and contains a liberal amount of special cast balls which do the pulverizing As the coal is pulverized to the proper degree of fineness, it is drawn from the mill by a current of air, induced by a fan, and is then blown into the furnace, where combustion takes place. With the right "mix" it takes but a short time to get results.

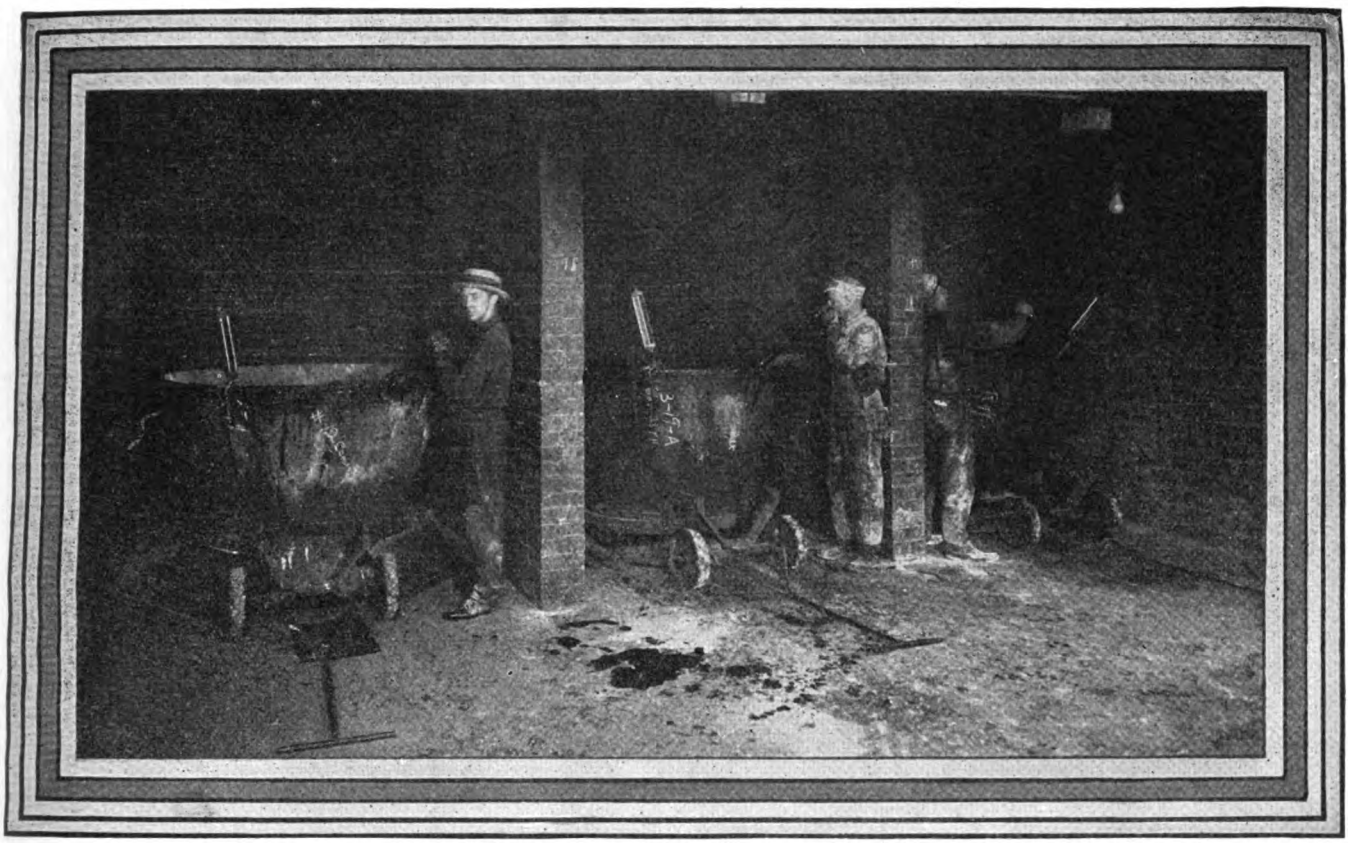
Cold Water to Steam in Thirty-five Minutes

When starting this boiler after a shut down, the boiler being filled wih cold water, it takes 35 minutes to produce a steam pressure of 100 lbs. If steam pressure has been allowed to fall to two or three pounds, due to a short shut down, it is possible to bring the pressure back to 100 lbs. in twenty minutes. It may be advisable to warm up to working conditions with somewhat less speed, but the time noted is quite within the range of the equipment.

(Continued on page 96)

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Tycos Maintains Quality

Prevents Costly Spoilage

IN the manufacture of paint and varnish, proper temperature control is a very important factor. Materials must be cooked or added at certain times, and at predetermined temperatures. Unless the proper temperatures are reached and maintained, the product may be spoiled or not be up to quality standards.

To safeguard their processes, the Steelcote Mfg. Co., St. Louis, Mo., installed *Tycos* Instruments. In speaking of the installation, Mr. George E. Niedt, Co-partner, says: "Other types of instruments have been tried, but *Tycos* have proved best for service and dependability. By protecting us against spoiling costly raw materials in process and assuring the maintenance of uniform quality in our products, *Tycos* Instruments pay us big dividends."

Are you having any difficulty with your materials in process? Why not let a *Tycos* Engineer suggest ways to get absolute temperature control. Our long experience is at your service. Write us today for our bulletin covering your difficulty. No obligations.

Taylor Instrument Companies

Rochester, N. Y., U. S. A.

Canadian Plant *Tycos* Building, Toronto

Short and Mason, Ltd., Manufacturing Distributors in Great Britain.

Tycos Temperature Instruments

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Slack Belts Prevent 3 Costly Belt Evils



Depending of course upon the number of belts used in a plant, savings of many dollars a year are being regularly made by running belts slack (instead of tight), after treatment with Cling-Surface. Slippage is reduced to natural creep, bearing troubles from strain of tight belts eliminated, and the life of belts greatly prolonged because of new flexibility and preservation.

A special survey by engineers in a New England mill (name on request), where over 500 belts had been treated with Cling-Surface, uncovered an average saving of $25.70 per year per belt—this does not take into consideration power savings, which could not be accurately checked.

Prove Cling-Surface benefits and economies to your own satisfaction with a 60-day approval test—or do not pay us one cent. Let us send trial quantity at $3.50 per gal.; 3 gals. at $3.40 per gal.; 6 gals. at $3.25 per gal. State whether conditions are warm, dry, dusty, or reverse. Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Openings for good salesmen

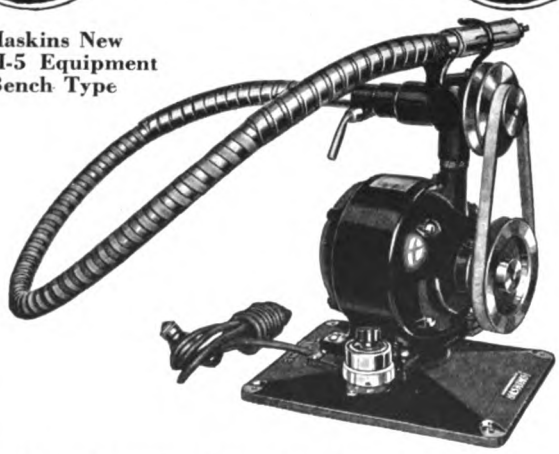
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SCIENTIFIC BELT TREATMENT

KNOWN FOR 30 YEARS

Save These For Work a Machine Can't Do

Haskins New H-5 Equipment Bench Type



¼ H.P. Ball-bearing Motor. New Improved Timken-bearing Four Speed Countershaft...Speeds, 875, 1,300, 2,350 and 3,500 R.P.M. No. 5 Ball-bearing Spindle. Powered from the nearest light socket.

There are so many tool applications to this Haskins Portable, Flexible Shaft Equipment that it will pay for itself in a short time in any manufacturing plant. Invaluable for grinding, scraping, wire brushing, drilling, filing, sanding, polishing, etc. ....

Write for new Haskins catalog giving complete information.

R. G. HASKINS CO.

Portable Flexible Shaft Machine

4640 Fulton Street C... ...inois

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(Continued from page 94)

The matter of the proper mixing of air and coal for complete combustion is without doubt the most difficult detail to determine and requires more attention in small installations than in larger ones. This point, however, is not by any means unsurmountable and can be readily accomplished.

The construction of the furnace is an important factor. We have found that the double wall arrangement, with an air space betwen the two walls, gives very satisfactory results. This construction permits of expansion and contraction without material damage and the air space seems to act as a non-conductor of heat, preventing the outside wall from getting excessively hot. At the same time it appears to prevent slagging on the inside due to the slight cooling effect on the inner wall. The absence of any considerable amount of ash is quite noticeable. This is no doubt due principally to the degree of fineness to which the coal and the incombustible content of it is pulverized and to the low velocity of the gases traveling through the furnace.

So far as we have been able to determine, 50 to 75

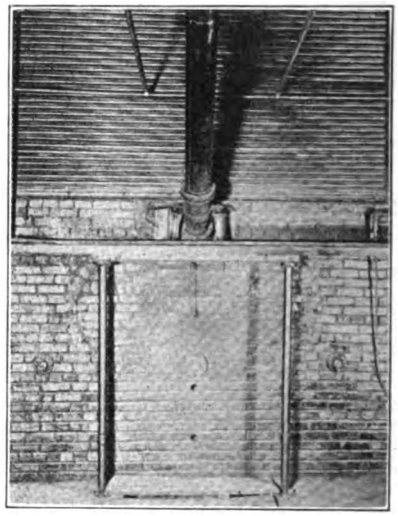


Fig. 2. Front view of the furnace showing the conduit for conveying pulverized fuel.

per cent. of the ash content of the coal is carried off by the atmosphere. Naturally, the finer the degree of pulverization, the greater the tendency for the air currents to carry the dust away. Contrary to expectations, there is no indication of any ash or dust deposit on the roofs of adjacent buildings or surrounding property and there is no smoke.

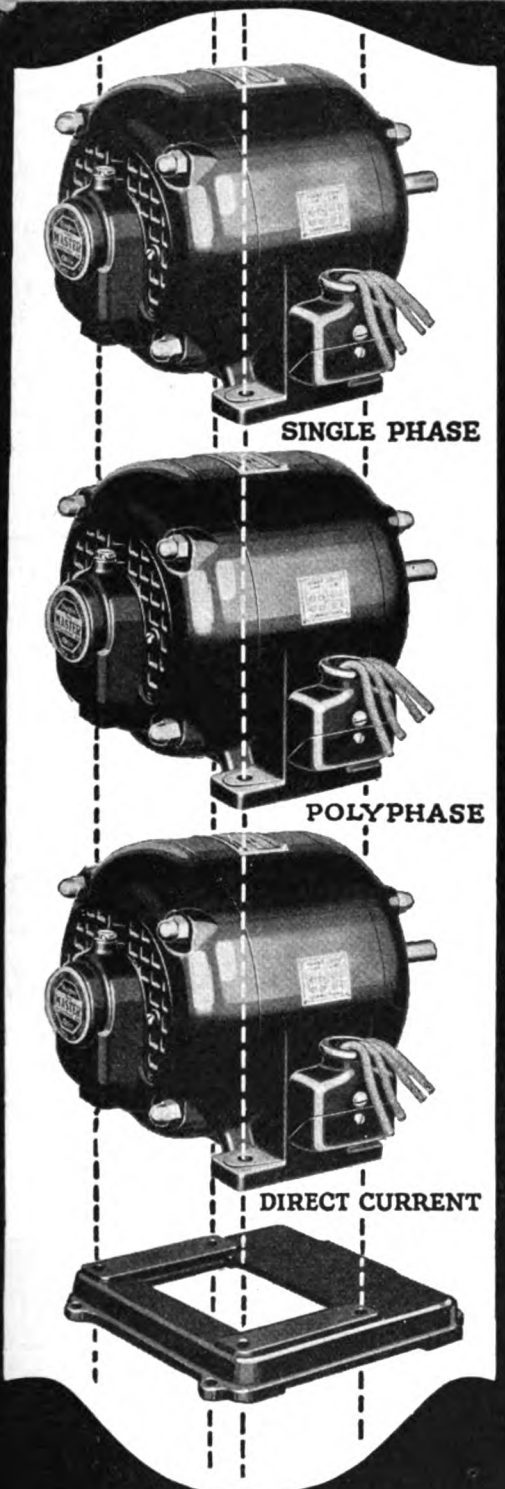
Operating Economies Obtained

We have effected a considerable actual saving by operating the equipment in this plant. A cheaper grade of coal can be successfully used; there is less labor required for handling both coal and ashes, and the efficiency is greater. Overload conditions, impossible with the old equipment, are now easily met. Saving is also effected due to the ability to completely shut down the equipment during noon hour periods, and at such other times as the steam consumption will permit. The boiler used with this equipment has evaporated between 8½ and 9 lbs. of water per lb. of coal.

(Continued on page 98)

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Interchangeable Frames ~ *in all types for same H.P. rating and speed*

To the manufacturer of motor driven equipment this means:

That dimensions can be standardized and motor mounting costs reduced.

That the type of motor can be changed in the field at less expense and trouble.

That the required investment in spare parts is a minimum.

This feature alone will save much time and money. And this is only *one* of the many splendid features of Master Guaranteed Motors.

THE MASTER ELECTRIC CO.
Dayton, Ohio

STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

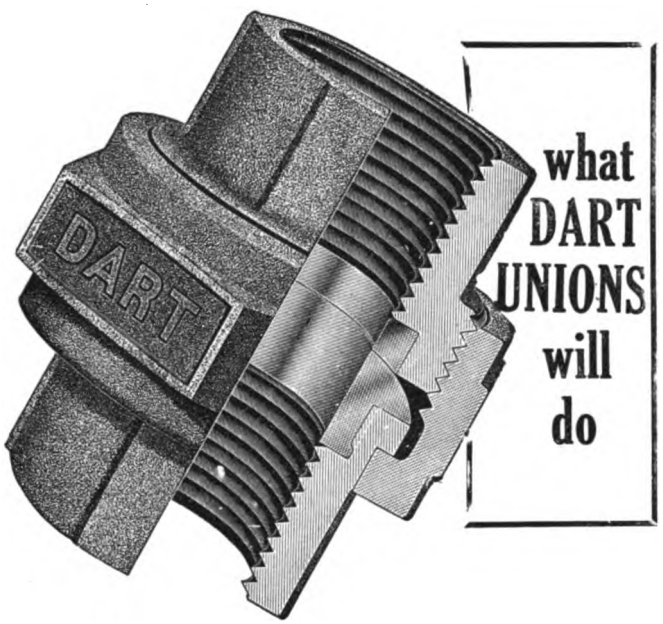
1/8 TO 7½ H.P.

Dayton THE MASTER ELECTRIC CO. Ohio

Less than 40°

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Canadian Factory: Dart Union Co., Ltd. Toronto, Canada

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Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

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Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

AMERICAN SAW & MFG. CO
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"The Tools in the Plaid

(Continued from page 96)

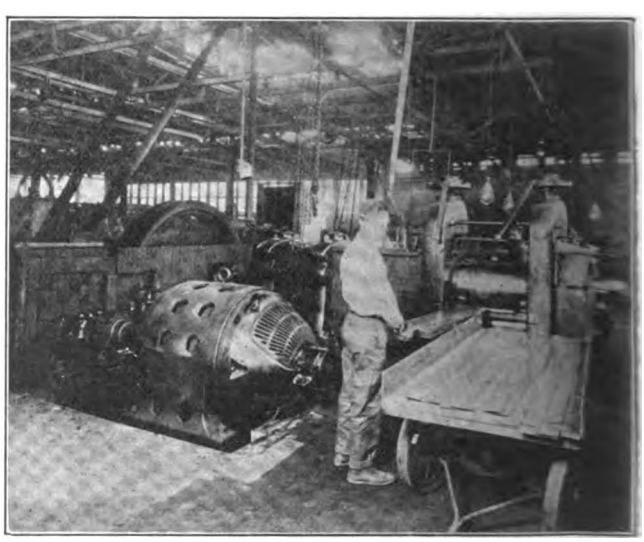
From the CO_2 record for two days' run (night omitted) during August when the normal load was very light it was noticed that there were intervals of from 15 to 25 minutes, averaging about 1¼ hours apart, when the pulverizer was shut down. Coal could not be fed in sufficiently small quantities to maintain proper combustion without producing too much steam with the feed pipe and burners as installed. From the CO^2 record for a twenty-four hour run during November, when the demand for steam was greater, it was noticed that this chart shows a much more uniform condition as the equipment was operated practically continuously.

This article is but the briefest sketch of our experience, without details as to test results, and without actual figures showing savings in fuel consumption or in labor. We have thought it worth while, however, to make this note of our own undoubted success in the installation of a small unit at low initial cost in a branch of combustion engineering which is not commonly considered except as applied to power plants of much larger capacity.

As manufacturers of steel belt pulleys and steel shafting hangers, we are selling in a highly competitive field. Every possible economy must be considered and taken advantage of. Our pulverizing equipment has been successful. The machinery is rugged and requires little maintenance. No pulverized fuel is stored so that the hazard is reduced to a minimum. We figure that the entire cost of the equipment was saved in operating expenses within two years from date of installation.

High Power Factor Self-Convertible Induction Motor

A NEW and ingenious design of electric motor starts as a slip-ring induction motor having torque characteristics much more favorable than the usual squirrel-cage type.



After the motor attains synchronous speed which it will do easily with 150 per cent. load, it becomes a self-

(Continued on page 100)

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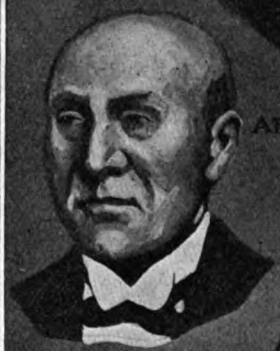
FAMOUS SEXTETTES

6 - FAMOUS TOOLS





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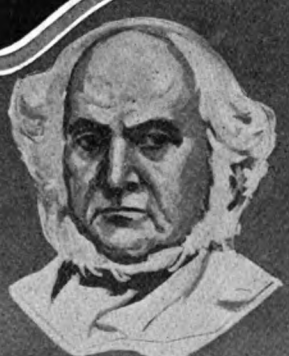
MARQUIS OKUMA



JOHN HAY



PRINCE OTTO VON BISMARK



WILLIAM GLADSTONE



BENJAMIN DISRAELI

6 FAMOUS MODERN STATESMEN

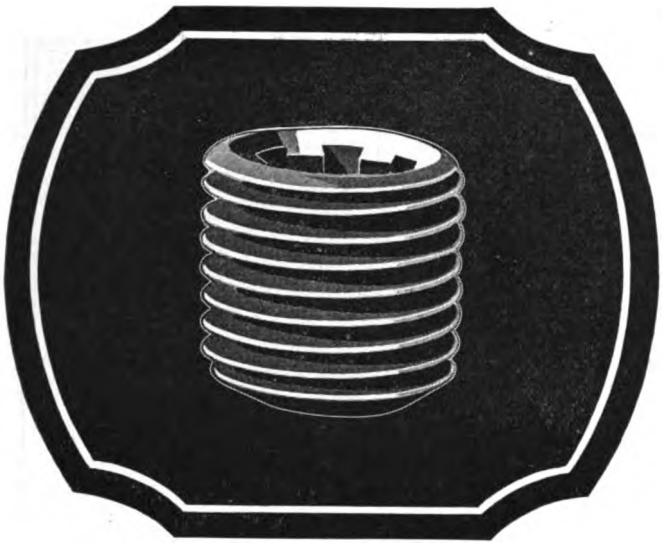
The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
NEW YORK-CHICAGO-LONDON



TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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The screw for every job because it's made for the *hardest job*

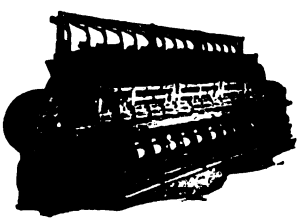


Very often a safety set screw is set only once, and is then forgotten. But there is a busy corner in every shop where another set screw is loosened and jerked into a tight set-up twenty or more times in a day. It is for just this sort of duty that Bristo hollow safety set screws are made.

The Bristo socket is designed to give the wrench a perfect grip on the screw. No matter how tight the set, you are not troubled with enlarged sockets and slipping wrenches; no splitting, no screws jammed in holes.

Here is the ideal set screw to make the standard in your shop, for both maintenance and production. Bristos cost less than many other hollow safety set screws, which cannot equal them in performance.

Bulletin CE-820 describes the patented dovetail flute socket design and the line complete. Send for your copy. The Bristol Co., Waterbury, Conn.



BRISTO Safety SET SCR[illegible]

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(Continued from page 98)

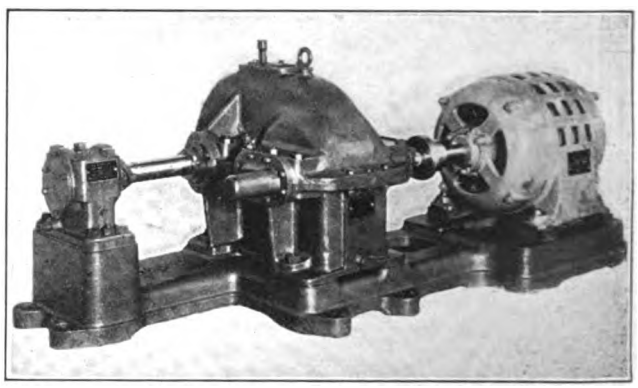
excited synchronous motor. As a synchronous motor, it will carry 150 per cent. load or more without falling out of step and above this value it operates as an induction motor and continues to run as such to the "breakdown point," which is rarely less than 250 per cent. of full load torque and usually more.

The transition from synchronous to induction motor takes place automatically, without any serious line disturbances. When the load on the motor has increased to such an extent as to cause it to fall out of step, it does not come to rest like the synchronous motor of the conventional type, but continues to operate as a slip ring induction motor, and is good for still further increase in load up to its breakdown point as an induction motor, which is considerably in excess of the load at which it fell out of synchronism. This breakdown point is rarely less than 250 per cent. full load. Under these abnormal load conditions, the motor operates with lagging power factor and a small slip, similar to a standard induction motor. When the overload has passed, the motor will again pull into step as a synchronous motor, without any manipulation on the part of the operator.

Standardized Reduction Gears

A NEW line of speed reducers features the continuous tooth, all steel herringbone gear. The gears are precision made, silent and highly efficient.

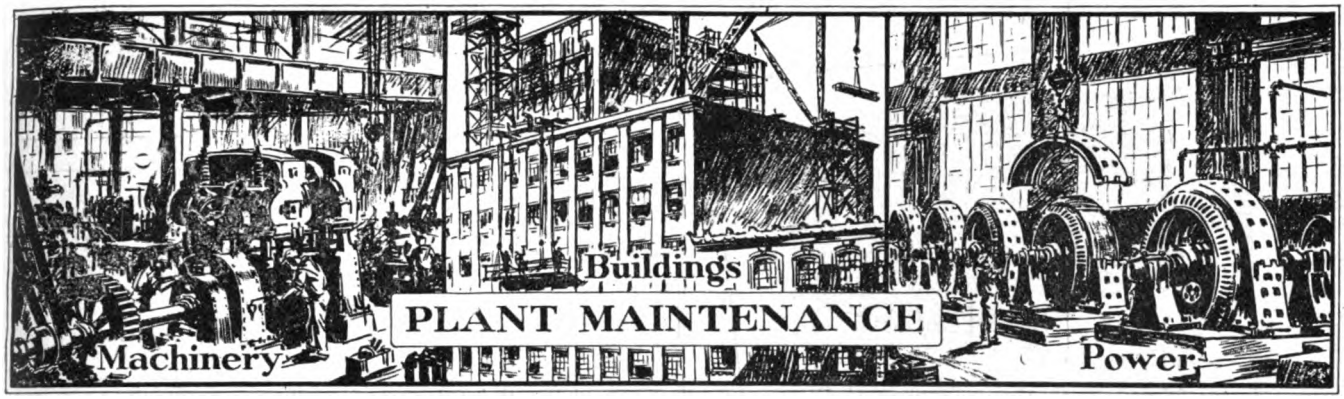
Special design of housing eliminates any internal ribs, projections or complicated cores. Lubrication has in this way been simplified and all possibility of dirt or core sand working into the gears is definitely removed. Added features are the airplane type, steel-backed, babbitt-lined bearings that are capable of carrying heavier loads and an improved automatic continuous lubrication system.



This line of reducers covers a certain number of standard reduction ratios. Standard motor beds have been adopted for these units. Standardization of units and beds in accordance with general industrial demands makes possible stock delivery of this precision product.

The reducers are made in three types—single reduction for ratios up to 9:1, double reduction for ratios up to 70:1, and triple reduction for ratios up to 300:1. A double reduction unit is shown in the illustration.

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Warming Up the Cold Spots

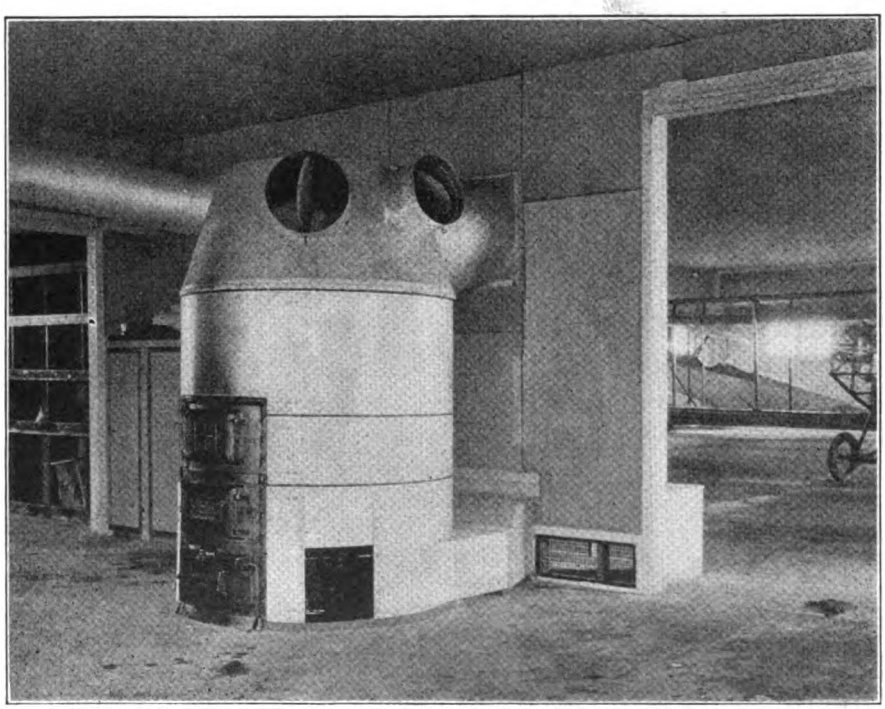
By C. Stanley Taylor

DESPITE the best efforts of heating engineers, almost every plant finds some room or part of a room not adequately heated during the cold weather. It may be that a much used door or the constant opening of large shipping doors may impose a burden on the radiation nearby, which it is not adequate to meet. It may be that an unheated building originally designed as a storehouse has been converted to production use and has become an unhealthful and difficult place in which to carry on work during the winter months.

The maintenance department can often solve these occasional problems by the installation of unit heaters of suitable design. Very often small units may be hooked up with existing steam mains and returns. Sometimes it may be necessary to run special feeders. Unit heaters are made in all sizes, from very light compact units which can be suspended directly from the steam mains themselves without other support, up to the high efficiency units of greater bulk and weight which are attached to walls, suspended from the ceiling with angle irons, or mounted directly on the floor. Capacities range from units equivalent to a few hundred square feet of direct radiation up to units that are equivalent to 8,000 or 10,000 square feet of direct radiation. Certainly from this range a unit heater can be found which will solve almost any problem.

It is perfectly possible and generally advantageous to install a unit heater arranged to force its warm air blast directly toward doorways leading to the outside for the sole purpose of checking the cold blast which endangers the health of workers nearby every time the door is opened. Units can be placed in odd corners or hung from the ceiling in so many ways that almost every spot can be taken care of by one or more such units with a minimum of installation expense.

For the unheated building, there are now direct fired unit heaters which resemble the old-fashioned household warm air furnace with a fire pot burning coal, gas or oil and with a fan which blows the warmed air to any desired point. When the unheated building is too remote from the power plant to run a main and return, such units will serve.



This looks like an ordinary hot-air furnace but is really a hot-blast unit heater in one of the hangars at Moline Flying Field, Illinois.

In addition to checking up on the cold spots and correcting them by means of unit heaters, it is a timely job for the maintenance crew to check over all parts of the heating system to see that the valves are properly packed, the

(Continued on page 102)

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Telling the World

About Milburn Guns

MSR tells our story of quality in the Milburn Paint Gun for us.

The *MILBURN* is the only gun that has a bronze forged body—a tensile strength of 60,000 lbs. per square inch.

Such quality added to the efficiency and reliability in the MILBURN Gun has established its world-wide leadership.

This is attested to by large industrials, railroads and Government Department who have standardized on the Milburn Gun after extensive tests and are now saving 80% in their painting costs.

Get the facts in Catalog 66—sent upon request

THE ALEXANDER MILBURN CO.

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For 20 Years—

Manufacturers of Air Pressure Equipment

air traps operating, and to discover and stop all leaks in pipe joints and in the radiators themselves. The importance of this work is quickly observed in vacuum and vapor systems; it is equally important for efficient operation in low and high pressure steam layouts.

They Keep the Paint Fumes Out of Doors

By Charles W. Geiger

SPECIAL facilities have been provided at the Headquarters Shops of the Southern Pacific Company at Sacramento for the painting of new freight car doors



Fig. 1. Doors being transferred to outdoor side track at painting plant.

by compressed air. As the doors are completed in the planing mill they are loaded onto four-wheel cars and transferred over the rails to a special side track as shown in the photo, where the doors are removed and set up against a wooden horse as in the other photo, and painted by paint spray. When the doors are dry they are loaded back onto a car and taken to the point where they are to be used.

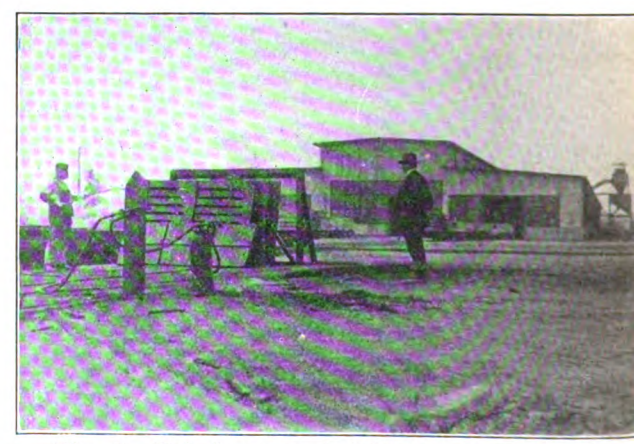


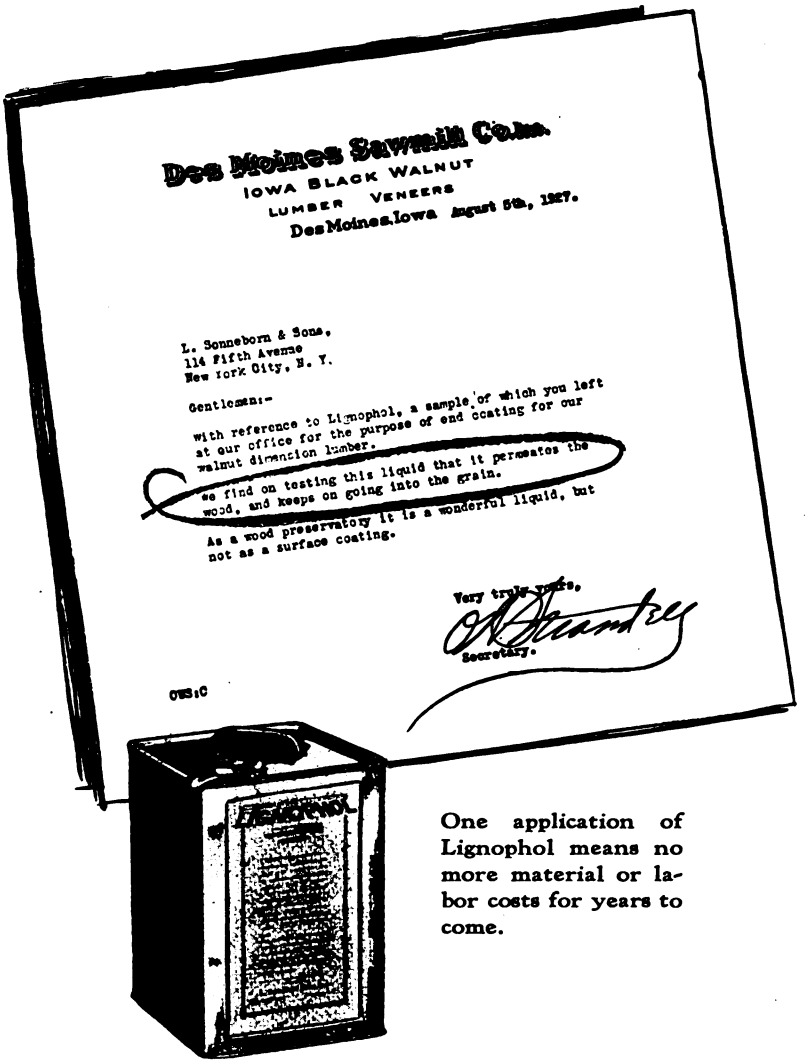
Fig. 2. Painting new freight car doors by air spray.

The door painting equipment is located some distance from any building and thus does not result in discomfort to other workers. Compressed air is piped to the point and connected to the paint receptacle. A long air hose extending from the paint receptacle enables the painters to work over a large area.

(See page 104)

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LIGNOPHOL
is a penetrating preservative for wood floors



One application of Lignophol means no more material or labor costs for years to come.

THE letter shown here proves this. Thorough penetration is essential in the process to restore new life to wood floors.

Lignophol penetrates the interior wood cells and fibres, filling them with life-giving gums and oils. Thus splintering—cracking—warping—dry and wet-rot are prevented, and besides a most pleasing, decorative finish is produced.

Linseed Oil, varnish, shellac and so-called preservatives are unsatisfactory. They do not penetrate like Lignophol. They soon evaporate or wear away. But Lignophol lasts for years.

Not only is Lignophol the most efficient agent to thoroughly revive and keep strong your new or old floors but it is also most economical. The labor cost is low. Lignophol is easily and quickly applied. There is no interference with the working schedule, and Lignophol gives years of service.

For office floors and wherever a medium or high polish is wanted, use Lignophol Wax Finish. Already contains wax. Need only be polished six hours after applied.

Sonneborn's reputation is your guarantee of Lignophol's merit.

Some Other SONNEBORN Products

LAPIDOLITH
The original concrete floor hardener. Adds years to life of concrete floors. Applied like water with a brush. Hardens overnight.

HYDROCIDE
A complete line of water and dampproofing products for walls, copings, foundations.

CEMCOAT
The paint that stays white when others turn yellow. Can be washed again and again. Adheres to brick or concrete as easily as wood.

L. SONNEBORN SONS, Inc.
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L. SONNEBORN SONS, Inc., 114 Fifth Ave., New York
Please send me, without obligation, demonstration samples and literature on: — Lapidolith ....; Lignophol ....; Cemcoat ....; Hydrocide Colorless ..... (Check products that interest you.)
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We offer a standardized Painting Procedure

VORCOLITE customers are not "paint shoppers." Far the greater number of them have found, in the Vortex Painting Method, a gratifying solution for all their painting worries.

1. **They make an annual appropriation for painting.**
2. **They standardize on Vorcolite flat white because of its rich pigmentation, long life, easy cleaning, perfect diffusion of light, and its complete coverage in single applications.**
3. **They achieve the lowest possible finished cost by means of the Vortex Painting Equipment—loaned without charge to Vorcolite users—which also means minimum nuisance, little if any scaffolding, no ordinary paint gun troubles. Their own "handy man" labor does the work and when through, guns are shipped back to us.**

Painting Equipment is Loaned

Most important of all, they learn to think of paint cost in terms of square feet, not price per gallon. Send for the Vortex check sheet and let us submit a proposal that will be suitable for your problem.

THE VORTEX MANUFACTURING CO.
1977 West 77th Street · · · Cleveland, Ohio

Vorcolite

and the VORTEX PAINTING METHOD



Fill out and mail

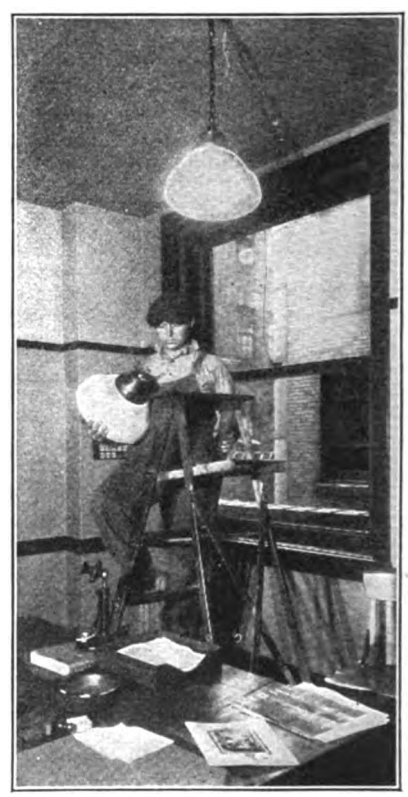
VORTEX MFG. CO.
West 77th St., Cleveland, Ohio
Please send us check sheet to outline our painting problem. It is on new construction? _____ Buildings already in use? _____
Company .....
Address .....
Attention .....

IV-39

Connector Socket Simplifies Maintenance of Lighting Equipment

AN INGENIOUS device known as the connector socket, simplifies maintenance methods, and reduces maintenance costs, on commercial lighting installations.

The device is a combination socket, separable plug and fixture hook. The socket is installed in the globe holder in much the same manner as a standard socket, but with two polarity lugs and a flat stamped steel hook protruding from the top of the holder. A connector body is wired to circuit at a point just below the last link of chain, if the fixture is a chain suspension, or below the fixture loop if steam construction chain or fixture hook, and the connector is then pressed through a slot in the connector body, attaches to the chain or fixture hook, and the connector is then pressed onto the lugs completing the circuit. We thus have a lighting fixture from which the holder, lamp and glassware can be removed as a unit.



The cleaner detaches the entire fixture and replaces it with a clean one.

When the glassware or globe is in need of cleaning or the fixture requires re-lamping, the maintenance man simply unhooks the holder complete with its lamp and globe, and replaces it instantly with a clean, freshly lamped holder unit, the operation requiring but one trip up the ladder.

(See page 106)

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"Good Soap"

Cocheco and Cleanliness

THERE are all kinds of soap—from the mechanic's paste, warranted to eliminate the deepest grime, to the tinted, perfumed soap of the beauty parlor. All good, and all made to one end—cleanliness.

Soap making is a great industry in these days. It takes vast factories to supply our needs. Great establishments with laboratories, power plants, machine shops—special equipment of the highest grade—provide "The Soap of a Nation." And in the background, behind the energy, the drive, the speed—Cocheco Belts—the dependable leather belts—the power belts of a thousand industries. I. B. Williams' "Book on Belts" is a guide to the belt **you** need. Copy at your service.

COCHECO TRADE MARK BELTING

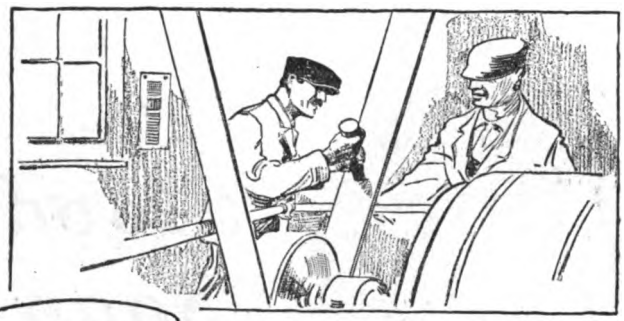
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"Never Saw Its Equal for Stopping Belt-Slip"

"You don't have to stop your machinery, to apply this DIXON Solid Belt Dressing. Just hold the end of the stick this way against the pulley side of the belt while she's running, and let a little of the dressing rub off on the belt. I never saw its equal for stopping slip on a belt. It seems to give the belt a real grip on the pulley.

"You use it on fabric belts too?"

"Sure, leather, fabric or rubber—keeps 'em all nice and flexible. I figure it's saved the life of more than one belt in this plant."

Here's a Valuable Little Booklet On Belts—

Full of pointed hints on belts and their care. Tells why belts deterioriate and how overloading, dirtiness, tightness and slackness influence belt life—belt performance. Do you want a copy? *If so, drop us a line.*



JOSEPH DIXON CRUCIBLE COMPANY

Jersey City, N. J. Established 1827

DIXON'S SOLID BELT DRESSING

We Originate and Build

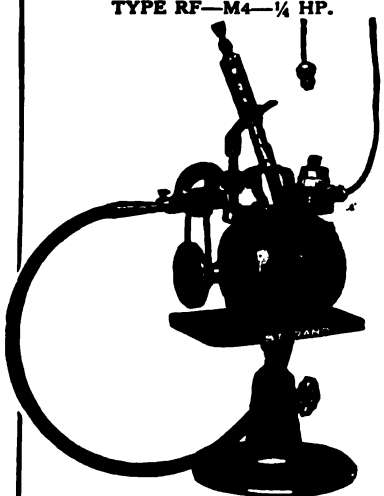
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A NEW DEVELOPMENT

TYPE RF—M4—¼ HP.



Here is a machine that will be appreciated by every mechanic who has anything to do with the finishing of dies or similar work—

ROTARY FILING GRINDING AND POLISHING

Simply attach to your lighting circuit.



This Equipment Consists of

8 assorted shapes, high speed steel, hand cut files, ball bearing hand piece, 9 assorted grinding wheels, 3 wheel spindles for same, 3x1 rubber polishing drum, three speed countershaft, flexible shaft 5 ft. long, ¼ HP. motor, mounted on adjustable swivel stand, wrenches, cord, switch and plug.

We Build Machines from 1/10 HP. to 2 HP. Send for Catalog

Manufactured by

N. A. STRAND & CO

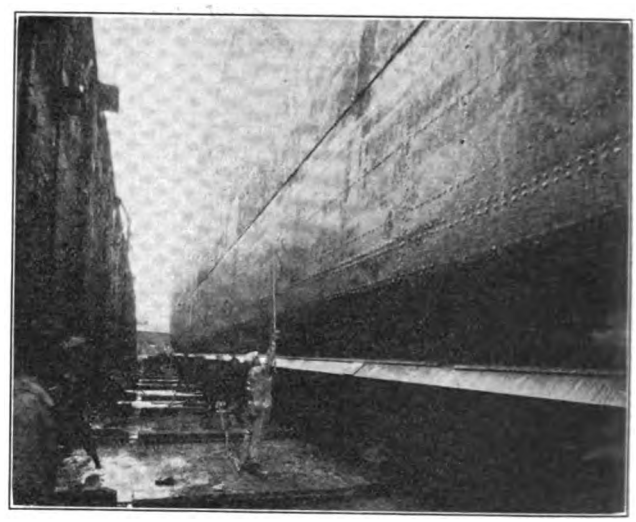
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For product *is issue write Industry Illustrated*

Extension Arms for Paint Sprays

THE extension for paint sprays is another useful development to aid painting and reduce costs. This device is for painting factory ceilings and walls, ship sides, tanks, freight cars, gondolas or other high surfaces without the use of so many ladders or scaffolding. This allows a convenient method of painting and a great saving in time. It grips a standard gun, which, while in use, can be swiveled to any desired angle.

The extension is 8 feet in length and this coupled with the operator's reach, projects the painting operation to an approximate height of 14 feet. Any length of extension can be furnished upon specification. For painting within arm's length the gun is immedately detachable and can be used as a hand spray.



The extension spray in use.

The extension is ruggedly constructed of strong tubing and has the gun and angle controls close to the bottom for easy manipulation of the spray. It is light in weight, well-balanced and easily handled. One man, with the extension spray con do five times more work than by hand brushing and at a much lower cost. While painting a shop at a navy yard, this type of spray covered 9,000 square feet of surface, spraying a heavy anti-fouling paint weighing 17 pounds to the gallon. The best previous record with other guns was 2,400 square feet.

OFFICIAL announcement comes from the Carnegie Institute of Technology in Pittsburgh that a second International Conference on Bituminous Coal will be held there during the week of November 19, 1928.

Decision to call a second congress of world scientists and fuel technologists has been made, it is announced, as a result of the widespread interest aroused throughout the world by the first Conference on Bituminous Coal held at the Carnegie Institute of Technology in November, 1926.

Although no definite program plans for the second conference have been made, it is expected that the 1928 session will cover the latest developments in obtaining substitutes for gasoline from coal, power from coal, low and high temperature distillation processes, smokeless fuel, gastification of coal, utilization of coal tar products, coal as a source for fertilizer, and coal in relation to the production of fixed nitrogen.

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A Buyer's Market in Factory Staples

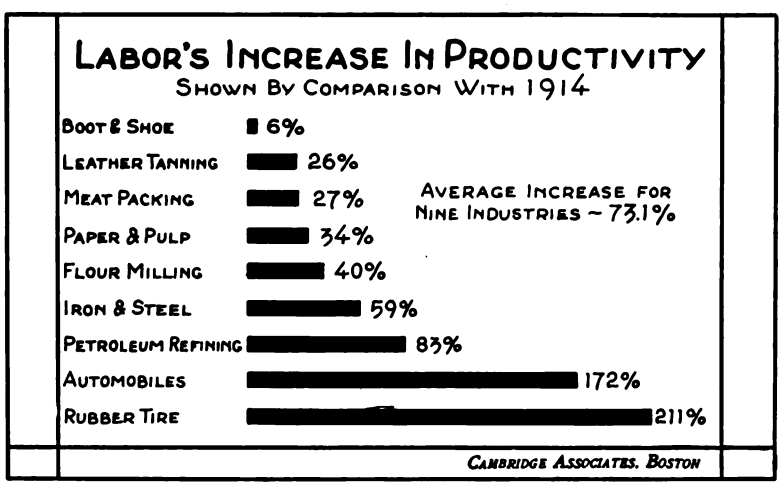
By George E. Mac Ilwain

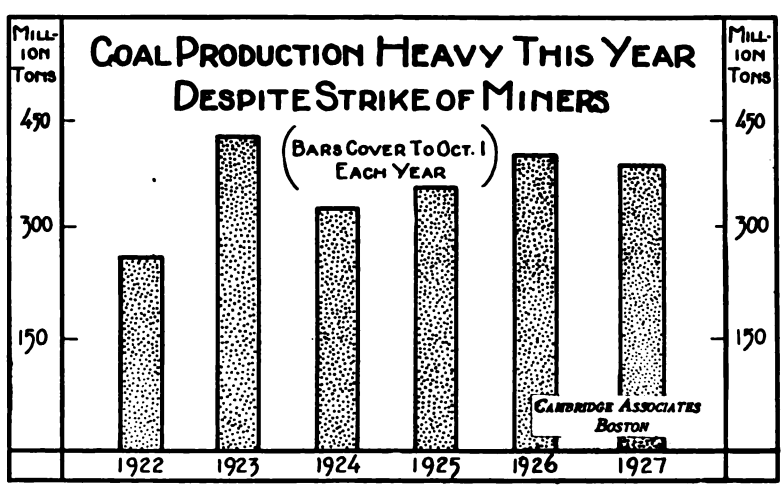
THE SOFT COAL strike has been a show-down on the strength of the miners' union in the soft coal industry. As the accompanying chart shows, the yearly production has been very little affected by the miners' strike. Production in non-union mines has reached a total for the year only a small fraction behind that of last year and the stocks on hand at present assure that no shortage will occur.

It is probable that the ultimate outcome will be a great weakening of the United Mine Workers' Union. Injunctions recently obtained strike at the heart of the union and the drain on their treasuries and their unpaid dues, leave them in anything but a promising situation.

We do not look to see soft coal prices go lower as a result of the re-opening of the mines where settlements of some sort have been made. Competition is not merely that of coal against coal, but of varieties of coal against each other and the best grades of steam coal have been coming forward in good volume from non-union mines all the year.

But the price of coal is as low as it should be and we believe that users should not hesitate to buy for their needs during the winter months. Any changes in prices will be of small amounts either way. There is, at present, no incentive to store up coal against future trouble.





Most Metals a Purchase

Generally speaking the non-ferrous metals are low. They should be purchased for needs in the near months. Stocks have accumulated and no great strength is to be anticipated in the non-ferrous market. Nevertheless, such changes as may come are likely to be upward and though the changes will probably not be of any great amount, buyers might as well take advantage of present advantages.

Oil, Petroleum, Iron and Steel Should be Bought

Present prices on oil and petroleum warrant purchases for needs and also iron and steel. We look for no lower prices on these commodities in the near future, nor do we anticipate any important changes upward in the near future. It is distinctly a buyers' market and buyers may as well take advantage.

(Continued on page 108)

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The nation's strength is the nation's health.

Buy Christmas Seals and help preserve it.

THE NATIONAL, STATE, AND LOCAL TUBERCULOSIS ASSOCIATIONS OF THE UNITED STATES

(Continued from page 107)

Labor's Attitude Favorable to Business

The chart of Labor Productivity in certain industries is based on U. S. Department of Labor investigations. It should interest readers of this magazine to notice that some of the greatest improvements in labor output have been in Iron and Steel, Petroleum Refining and Automobiles. There is no more important developement in recent years, not only for the industries that show the greatest improvement, but for business as a whole.

To the purchasing agent it means that we have little to fear from mounting labor costs in the next few months. There is more widespread industrial peace than we have known for years. Strikes are at their lowest point. Jobs are hung onto with grim determination.

Wage increases have gone about as far as they are likely to go. Sometime during 1928 we are likely to see a definite turn toward lower wage rates. For the present, however, wages will change little either way and the only change in their effect on prices will come from more of the same kind of thing that the chart shows. And there *will* be more of it!

The Trend of Prices

Just now we are having a little upward swing in the general prices of commodities. Most of the recognized indices reflect this upward tendency. Always in the back of the mind of the Purchasing Agent should be the conviction that the *long swing* trend of prices is downward. In my judgment we shall not have gone far into 1928 before this downward tendency will be resumed. The present upshoot in prices is only an episode in this longer price curve.

When prices in general trend downward for any length of time, most commodities share in the effect of such a trend. Only exceptional conditions surrounding the production and sale of any special commodity make it possible for that commodity to pull away from the general tendency.

We have not started upward to new highs in prices. We are merely having a short reaction from the downward trend of the past two years.

A MANDATORY ruling requiring every employee in an industrial shop to wear goggles while at work was advocated recently by Harry Guilbert, Director of Safety of the Pullman Company, in an address before a joint session of the National Safety Council and the National Committee for the Prevention of Blindness. Addressing safety engineers, industrial physicians, oculists and others concerned with the prevention of blindness who are gathered in Chicago for the first national conference on this subject, Mr. Guilbert revealed that such a mandatory rule is enforced in all the repair shops and yards of the Pullman Company, and that as a result, the eyes of approximately a thousand of their men have been saved from serious injury or destruction.

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BEARINGS

Oilless Bearings—Bearings that have given twenty years service without one drop of oil being applied. Arguto Oilless Bearing Company. Page 53.

Ball Bearings—Wherever materials must be handled quickly and economically, users of Hyatt equipped trucks and trailers are profiting by its efficiency. Page 84. Hyatt Roller Bearing Company.

Cut expense in Half and Add to Profits. The New Departure Manufacturing Company. Page 37.

ELECTRICAL EQUIPMENT

(Motors, Generators, Buffers, Polishers, Grinders, etc.)

Lights—Where and when needed are described by The American Fixture Company. Page 70.

Portable Electric Lights—Bulletin 501-S, describing all the uses of the Reelite cable, is offered by Appleton Electric Company. Page 51.

Motors—That give satisfaction. The Master Electric Co. See page 97.

The "Linc-Weld" Motor is constructed for the service on which it is to be used. Page 93. The Lincoln Electric Company.

Bulletin 400 describes the Reliance Ball-bearing Motor that lowers upkeep charges and cuts down interruptions. Page 49. Reliance Elec. & Engg. Co.

MAINTENANCE

Brushes—and wire wheels. Guaranteed to stay together for full service life. See page 80. The Osborn Manufacturing Company.

Fans—A man cooling fan that increases production is described in circulars offered by Robinson Ventilating Company. Page 110.

Exhaust Fans—quiet operating exhaust fans for private and general offices. See Page 92. Diehl Manufacturing Company.

Cleaning Material—Industrial Cleaning Materials and Methods are described by The Oakite Products, Inc., Page 73.

Window Cleaners—Cleans the dirtiest windows quickly and safely. See page 113. The Gerson Stewart Corp.

Paint Spray Equipment—One spray does all your painting. Saves 80% in time and costs. The Alexander Milburn Co. Page 102.

Paints—The Vortex Painting Method is described by The Vortex Manufacturing Company. Page 104.

Write for booklet "More Light" and a sample panel painted with Barreled Sunlight. Page 3. U. S. Gutta Percha Company.

Paint preservatives are shown on page 103 by L. Sonneborn Sons, Inc.

Safety Ladders—Possesses many exclusive features and is low priced. Write Dept. 11-11 for complete information. Dayton Safety Ladder Co. Page 111.

Buildings—Planning window height for better daylighting effect. Detroit Steel Products Company. Page 4.

MATERIALS HANDLING

Electric Hoists—Keep the machines active so they produce the utmost. Roeper Crane & Hoist Works, Inc., Page 50.

Sprague Electric Hoists have worm drive, automatic lubrication, are simple in construction, thoroughly enclosed and of a design that has proved eminently successful for twenty years. Sprague Electric Hoists, Division of Shepard Electric Crane & Hoist Co. Back cover.

Hoists—that fit the greatest imaginable number of local conditions and is most generally useful of all types of hoists. Write for further information. Curtis Pneumatic Machinery Company. Page 78.

A "G-M" plus "C-M" equipment will make savings for you. Write for booklet. See pages 60-61. The Chisholm-Moore Mfg. Co.

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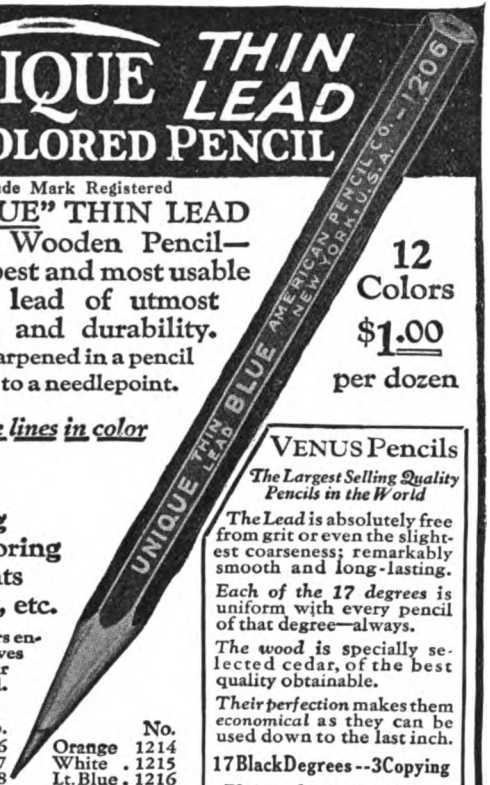
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Man Cooling

FANS



There is as much difference between ROBINSON MAN COOLING FANS and other makes as there is between one machine and another of the same type.

ROBINSON FANS are equipped with cast aluminum wheels which give

20% *More Air at Same Speed With Less Power*

These aluminum wheels require less power than any other propeller type wheel on the market. You will appreciate this if you believe in the utmost in fan efficiency at the lowest cost.

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Zelienople, Pa.

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TURBINE & CONIFLO FANS

Portable Cranes—A Small Portable Crane that is sent on 30 days' trial is described in Catalog IN. The Canton Foundry & Machine Company. See page 82.

Cranes—A Compact Crane Trolley that has unusual strength and rigidity. See Back Cover. Shepard Electric Crane & Hoist Company.

Belt Conveyors—that save man power. See page 52. Weller Mfg. Co.

Conveyors—that have increased production production in one company 100%. The Jeffrey Manufacturing Company. See page 5.

Conveyors and track unloaders and their economies are described in the booklet of The Chicago Automatic Conveying Company. Page 54.

For eliminating handling wastes, reducing time between operations, write for "Seven Economies of Logan Conveyors." Logan Company. See page 1.

Pneumatic Conveying—The modern system that recovers 99% of dust and fumes. The Dust Recovering & Conveying Company. Page 85.

Overhead Conveying Systems—R-W OveR-Way System saves time. Page 25. Richards-Wilcox Mfg. Company.

Overhead Handling Systems—A complete line of hoists, chain blocks, trolleys, traveling cranes, and monorails. See Reading Chain & Block Corp. See 76.

Scales—"Weigh While You Convey," described by The Merrick Scale Mfg. Co. Page 44.

Chains—For elevating, conveying and power transmission. Link-Belt Company. See page 116.

Pressed Steel Equipment—For materials handling. Write for illustrated literature and prices. See page 82. The Powell Pressed Steel Co.

Casters—Triple Ball Race construction; rugged. Bond Foundry and Machine Company. Page 67.

Ladles—Rowell Bottom Pour Ladles eliminate danger. Rowell Mfg. Company. Page 70.

Industrial Trucks—that are self-loading. The Yale & Towne Mfg. Co. Page 32.

Lift Trucks—that don't wear down or wabble. Page 77. The Stuebing-Cowan Co.

Wire Rope—of uniform construction that gives maximum protection. Williamsport Wire Rope Company. Inside Back Cover.

POWER PLANT EQUIPMENT AND AUXILIARIES

Portable Dust Blowers—that reduce fire hazard and motor troubles. See page 50. Electric Blower Company.

Steam Traps—Backed by 35 years experience and a positive guarantee. Write for Bulletin 833. Illinois Engineering Company. Page 57.

Temperature Regulator—Sarco Temperature Regulator puts a stop to guesswork. Test it for thirty days free. Write for Booklet R-98. Sarco Co., Inc. Page 48.

Unions—A free trial offer is made by E. M. Dart Mfg. Co. Page 98.

Freed Water Regulators—always on the job, insuring a constant water level. Send for catalog. See page 94. The Chaplin-Fulton Mfg. Co.

Unit Heaters—A heater that raises the efficiency of the worker. American Blower Co. See page 75.

Mechanical Draft Appliances—Write for booklet describing Buffalo Forced and Induced Draft equipment. Shows installations in many of the foremost power plants. Page 115. Buffalo Forge Company.

Pumps—Write for copy of centrifugal pump bulletin. Page 12. Nash Engineering Company.

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TOOLS AND SHOP EQUIPMENT

Drills—For high speed drills, see The Standard Tool Company. See page 73.
The six famous twist drills are described by The Cleveland Twist Drill Company. See page 99.

—that repeatedly demonstrate their superiority. It will pay you to try them out. See page 38. Morse Twist Drill & Machine Company.
2-Speed Electric Drills—necessary for maximum efficiency. See page 40. The Cincinnati Electrical Tool Co.

Drives—The LENIX is the pioneer short center belt drive. Manufactured by F. L. Smidth & Company. Page 6.

Files—Write for a copy of "Files of Precision"—containing useful information. See page 66. American Swiss File & Tool Company.

Finishing Machines—Flexible rotary filing, grinding and polishing machines. See page 106. N. A. Strand & Co.

Ball Bearing Grinders—Alternating and Direct Current. See page 41. The United States Electrical Tool Company.

Surface Grinders—Particularly efficient on a wide variety of small tools. Full particulars may be had from the La Salle Tool Company. See page 40.

Grinders—and buffers. Complete line is described in catalog, sent free on request. The Black & Decker Mfg. Co. Page 69.

—that save time and money. Wisconsin Electric Company. See page 43.

—with tool room accuracy and wide range adaptability. Write for Catalog 35-1. See page 87. The Hisey-Wolf Machine Co.

Taper Pin Reamers—Ream holes in any metal three times as fast as a Fluted Reamer. See page 86. The Gammons-Holman Co.

Pipe Threading Equipment—The Oster Manufacturing Company, manufacturers of the most complete line of pipe threading equipment in the world. Page 45.

Crating Saw—Cut your crating pay roll and speed up your shipping room. See page 44. The Parks Woodworking Machine Company.

Saws—that cut clean. See page 98. American Saw & Mfg. Co.

—Durable under severe service and reliable on accurate service. Simonds Saw and Steel Company. Page 2.

Set Screws—Full descriptions in Bulletin CE-820. The Bristol Company. Page 86.

—The Allen Mfg. Company. See page 74.

Shop Tools—Write for catalog that lists many long-lived, accurately designed, reliable tools. Brown & Sharpe Mfg. Co. Page 68.

Tool Holders—Write for Catalog B-27, showing complete line. Armstrong Bros. Tool Co. Page 72.

Lever Vises—Quick Operating and Wide Opening. See page 86. Edw. Purvis & Sons.

Vises—Designed to give strength where it is needed and to make the vise handy in actual use. See page 64. Prentiss Vise Company.

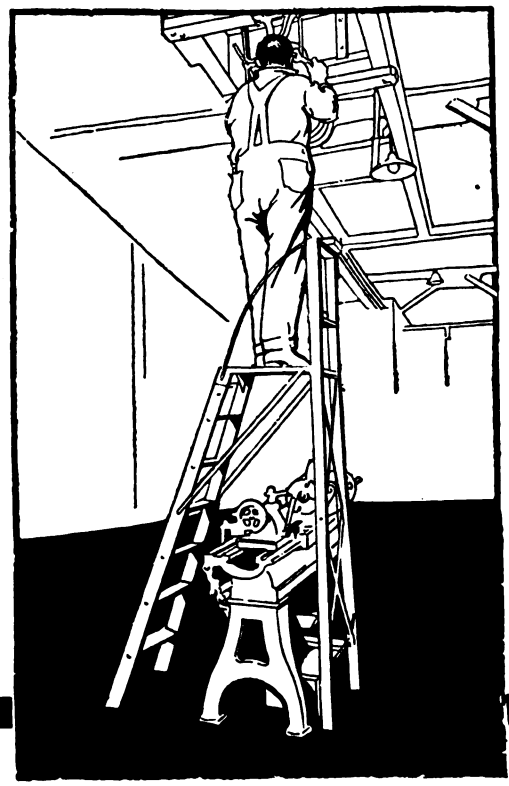
—Their construction has been a feature of this famous vise for 85 years. See page 72. Charles Parker Company.

Wrenches—Every "Superrench" is guaranteed against breakage. Page 81. J. H. Williams & Company.

—Two Rugged Patterns for heavy duty service. Page 92. Lowell Wrench Company.

—Of Chrome Vanadium Steel are described by Bonney Forge & Tool Works. See Inside Front Cover.

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To equip your plant with Dayton Safety Ladders is to make a great and permanent improvement! For a score of years they'll save time on countless jobs, and guard the lives and limbs of all who use them.

On the broad platform of the Dayton, the workman does his task as quickly and confidently as on solid ground—all his tools beside him—no running up and down.

Wide leg-spread surmounts every obstacle—gives the Dayton the stability which prevents wobbling, tipping, slipping, sliding or collapsing.

The Dayton is made of steel-braced aeroplane spruce—in sizes 3 to 16 feet—folding compactly for carrying or storing—the finest ladder ever built! Investigate its many exclusive features and low price today!

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TRANSMISSION EQUIPMENT
(Including Belting)

Clutches—offering the complete answer to the problem of starting, stopping and machine control. Page 58. The Conway Clutch Company.

—that prolong the life and increase the working capacity of the machine. Twin Disc Clutch Company. See page 71.

Flexible Shaft Equipment—Flexibility is an outstanding advantage of Haskins Equipments. R. G. Haskins Company. See page 96.

Belt Dressing—that influences belt life and belt performance. See page 106. Jos Dixon Crucible Company.

Beltings—The "Book on Belts" is a guide to the belt you need. Copy at your service. I. B. Williams & Sons. Page 105.

—Alexander Brothers, Inc., manufacturers of Leather Belting since 1867. Page 73.

—Tested by over 30 years' use. Cling-Surface. See page 96.

—that last longer because they are more pliable. Write for free Booklet. Chas. A. Schieren Co. Page 55.

Gears—The Medart Company furnished gears in practically every type, material, construction and size. Page 88.

Pulleys—Made of pressed steel for strength and light weight, reducing line shaft loads and lessening hazard. See page 46. The American Pulley Company.

Roller Chain—Write for booklet "Rolling the Problems Out of Transmission." See page 39. The Diamond Chain & Mfg. Co.

Variable Transmission Unit—A catalog describing The Lewellen Transmission for varying speeds is offered by the Lewellen Mfg. Company. Page 87.

Speed Reducers—smooth and quiet in operation, they give perfect timing between each individual job producing a unified whole which means maximum production. R. D. Nuttall Company. See page 8.

—For longer life. Less upkeep. Write for Catalog No 26. See page 47. W. A. Jones Foundry & Machine Company.

Speed Reducers—The Reeves Transmission represents the only method by which you can get any speed on any machine at any time. Reeves Pulley Co. See page 7.

MISCELLANEOUS

Abrasives—for wood sanding and metal. H. H. Barton & Son Co. See page 56.

Oilers—Oil cups, oil reservoirs and feeders for all purposes. Gits Bros. Mfg. Co. Page 94.

Welding and Cutting Equipment—Alexander Milburn Company. See page 102.

Goggles—For protection against light fumes and smoke. Willson Goggles, Inc. See page 113.

Hangers—that enable overhead lamps to be lowered away from the electric circuit for cleaning reflectors or renewing bulbs. See page 45. The Thompson Electric Co.

Pencils—Twelve colors in thin leads for all purposes. American Lead Pencil Company. See page 110.

Counters—A full line of magnetic and mechanical counters for all machines is offered by The Veeder Mfg. Co Page 42.

Sheet Metal Parts—that replace other forms of material now being used. Page 66. The Breese Bros Co.

Tanks—Horton Tanks supply water instantly. Chicago Bridge & Iron Works. See page 65.

Measuring Instruments—**Instruments that** carry the guarantee of seventy-odd years of manufacture are described by Taylor Instruments Companies. Page 95.

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Just around the corner there's an accident watching for a delay in shipping your safety goggles. See that they don't arrive too late.

Willson Safety Goggles *are carried in stock* by Willson Factory Depots located all over the country. There's a Willson Depot near you,—put there to save time on your order. Willson products are shipped instantly.

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Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912

of INDUSTRY ILLUSTRATED, published monthly, at New York, N. Y., for October 1, 1927.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the state and county aforesaid, personally appeared John R. Dunlap, who, having been duly sworn according to law, deposes and says that he is the Editor-in-Chief of INDUSTRY ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, The Engineering Magazine Co., 381 Fourth Avenue, New York, N. Y.
Editor-in-Chief, John R. Dunlap, 381 Fourth Avenue, New York, N. Y.
Editor, Morgan G. Farrell, 381 Fourth Avenue, New York, N. Y.
Business Manager, Harvey Conover, 381 Fourth Avenue, New York, N. Y.

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Editor-in-Chief.

Sworn to and subscribed before me this 29th day of September, 1927.

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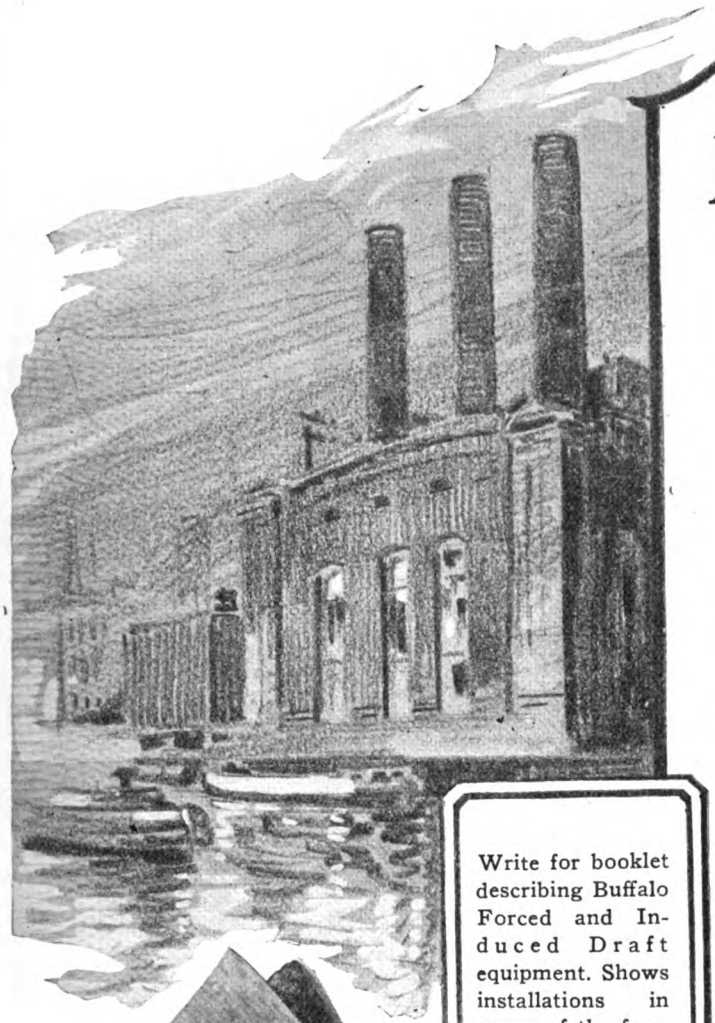
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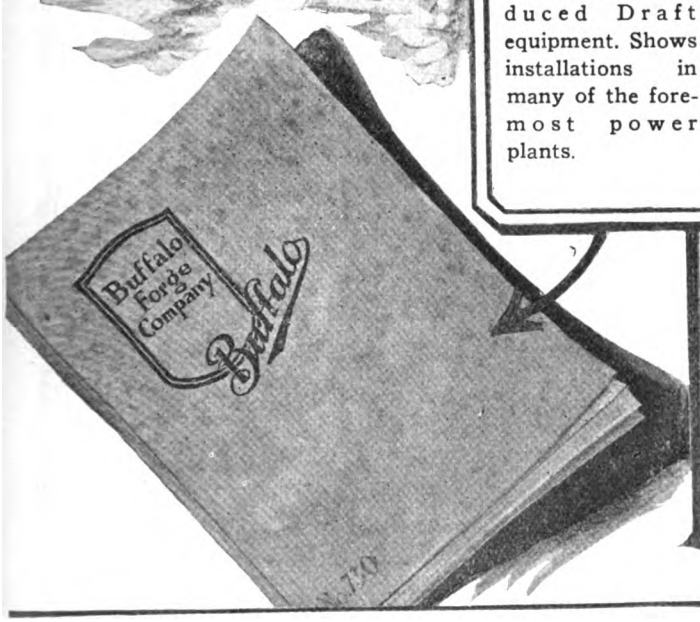
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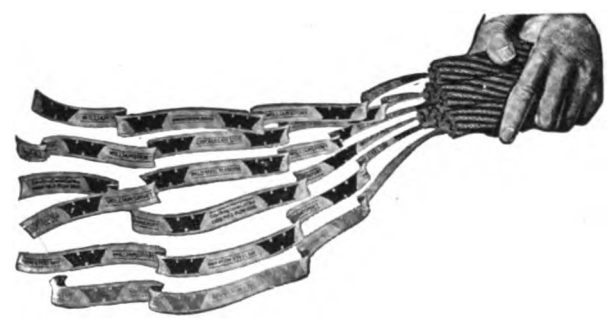
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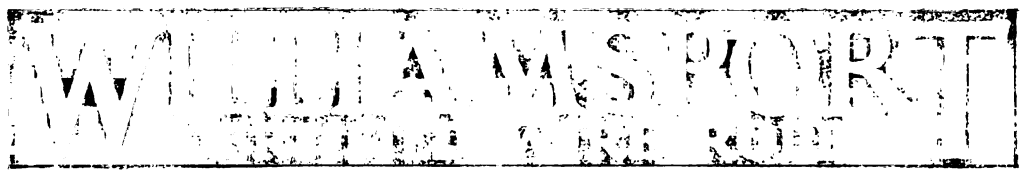
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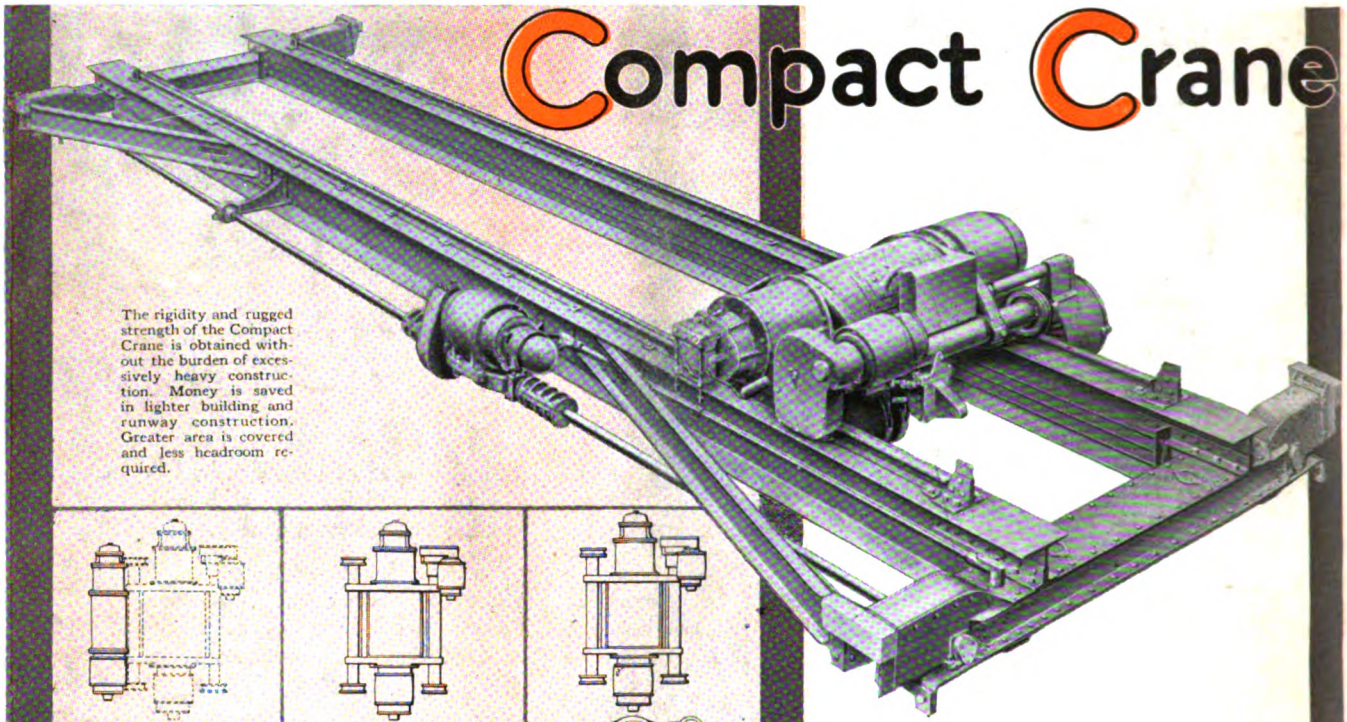
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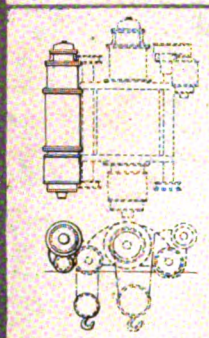
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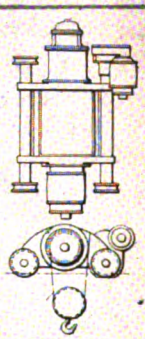
Compact Crane



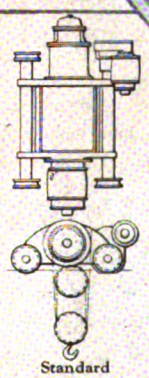
The rigidity and rugged strength of the Compact Crane is obtained without the burden of excessively heavy construction. Money is saved in lighter building and runway construction. Greater area is covered and less headroom required.



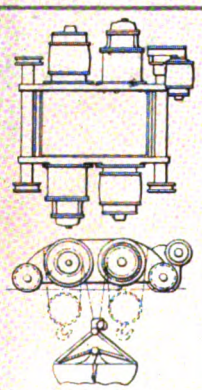
Auxiliary Hoist
can be attached to any Shepard Crane Trolley



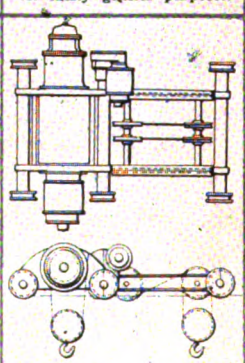
Standard
1 and 2 part double reeving, for many general purposes.



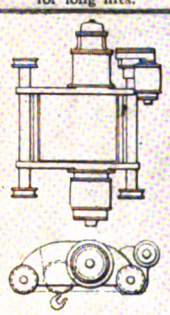
Standard
3 and 4 part double reeving. Extra long drum furnished for long lifts.



Double Hook
2 hoisting units of equal capacity, for grab buckets and double hook service.



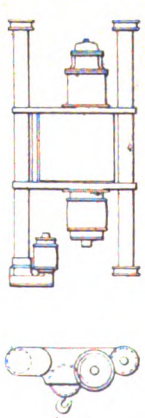
Extension
2 hooks for lifting simultaneously at two points long loads parallel to crane girders.



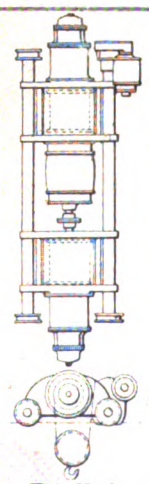
Close Lift
Permits hook to come close to trolley rail.



Submerged
Runs between and on the lower flanges of two I-beam girders.



Close Clearance
Permits location of trolley rail close to ceiling or roof.



Twin Hook
Two drums and two hooks operating simultaneously and at right angles to trolley rail.

with a trolley specially suited to each job

– minus a special job price

A Compact Crane Trolley has unusual strength and rigidity. The load carrying frame is all steel construction. The girts are box section steel castings, connected by a body piece of wrought steel plate, securely riveted or welded and amply braced on the underside. Axle brackets of heavy seamless drawn steel tubes carry the frame.

A sectionalized design affords a trolley arrangement to suit precisely your plant and load-moving conditions—a few of the many adaptations are shown.

Let a Shepard representative explain fully the advantages of this unique design and its economy.

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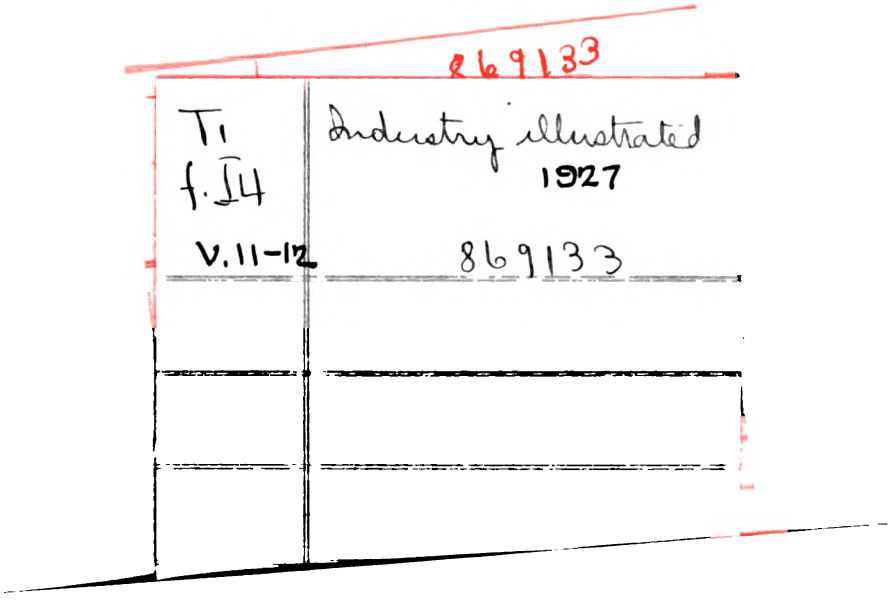
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